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EXPERIMENT STATION RECORD

Vol. 81 JULY 1939 No. 1

JACOB GOODALE LIPMAN, 1874–1939

The sudden death on April 19, 1939, of Dean and Director Jacob Goodale Lipman of New Jersey removed from the land-grant institutions a leader of unique personality and comprehensive interests. Overcoming many handicaps, his career had been one of consistent advancement and increasing influence. There have been few men in comparable positions who have become more widely known or whose assistance in the development of agricultural science has been sought and rendered more freely.

Dr. Lipman's success has been a logical result of his keen mentality, his genius for organization, and his unsparing industry. To an unusual degree he rose by his own efforts. Born in Friedrichstadt, Russia, on November 18, 1874, he came to the United States when a boy of 14, and for a time was employed in a law office in New York City. In 1891 his family settled in the Baron de Hirsch Colony at Woodbine, N. J., where he made his first contacts with practical farming in the reclamation and development of the scrub oak land of the region and studied agriculture in the farm school. Three years later he won a State scholarship in Rutgers University, meeting his college expenses largely by farm work and the testing of cattle for advanced registry, then in its early stages. He received the B. S. degree in 1898 and was appointed assistant chemist in the fertilizer inspection laboratory of the station. The next year he took up graduate work in soil chemistry and bacteriology at Cornell University, earning the M. A. degree in 1900 and the Ph. D. degree in 1903.

Even before the completion of his studies, Dr. Lipman was invited to return to New Jersey to organize what was probably the first station department of soil chemistry and bacteriology. He entered upon this pioneer field in 1901, and in the succeeding decade built up a considerable staff, equipment, and program.

Much of his work was carried on in close association with Director E. B. Voorhees, and upon the death of the latter in 1911 the selection of Dr. Lipman as his successor was in keeping with the tradition of the institution. He soon announced a policy of enlarged service based

upon a wider publicity for the work, a more effective dissemination of the station results, and an increased specialization. Within 3 years five new departments had been established—poultry husbandry, seed analysis, plant pathology, agronomy, and farm management and extension—and the work in animal and dairy husbandry had been divided. The inspection service was made more effective. Cranberry and blueberry investigations were begun in 1916, and egg-laying and breeding contests in 1917.

These somewhat radical beginnings in a relatively conservative environment were continued in later years. The physical plant was greatly enlarged, with practically a complete set of new and substantial buildings and much additional land and equipment. Substantially increased income was obtained. For the fiscal year 1912 the State appropriated $89,048 for the work of the State station; in 1938 the comparable State funds available were $512,090. While numerous factors entered into this expansion, by no means the least were the unusual foresight and shrewd business management of Dr. Lipman and the support and confidence which he had inspired among the people of a State not primarily agricultural in its economic and social outlook.

Arduous and punctiliously performed as were the duties of the station directorship, they absorbed only a fraction of Dr. Lipman's energies. In 1902 he had been made instructor in agricultural chemistry, in 1906 assistant and associate professor, and in 1910 he became professor of soil fertility and bacteriology. Since 1913 he had been professor of agriculture, and since 1915 dean of the College of Agriculture. He had also continued as chief of the station division of soils and crops. In all these he rendered effective service. As his biographer in the station history pointed out in 1930, "Dr. Lipman has made soil science a live and glowing subject for scores of students—graduate and undergraduate. His researches and writings have been fundamental and brilliant. But together with scientific research he has been able to combine the very difficult, often exacting, task of administration."

Added to his services for Rutgers and the New Jersey Stations, formally recognized in 1923 by the conferring upon him by the university the honorary degree of doctor of science, was a sustained participation in a remarkable range of interests of national and international scope. Prominent among these inevitably was the Association of Land-Grant Colleges and Universities. He was very active in this organization, holding many offices and performing much useful committee service. He was elected vice president for 1928 and president for 1936, delivering in the latter year an address entitled The Land-Grant and Our Land, in which he visualized some of the

accomplishments of the land-grant institutions and Federal Department of Agriculture and pointed out numerous problems awaiting solution.

Dr. Lipman was a charter member of the American Society of Agronomy in 1907 and the founder of *Soil Science* in 1916. He served as editor-in-chief of this journal throughout the succeeding years, as well as associate editor of a number of other scientific journals. His own publications were also voluminous, including a long list of technical papers on soils, soil bacteriology, agronomy, and many other phases of agriculture and country life.

In the field of international relations it seems probable that no representative of American agricultural science has had more extended and intimate contacts. He was a member of several European academies of agriculture, many foreign societies, commissions, and other groups, and the recipient in 1930 of the degree of honorary doctor from the Catholic University of Santiago, Chile, and an honorary membership in the faculty of the University of Santiago. His most conspicuous service in this connection was with international soil science meetings. He was active in the 1922 conference in Praha and the Roma conference in 1924, served as president of the First International Congress of Soil Science held in Washington, D. C., in 1927, and was chairman of the American delegation to the 1935 meeting in Oxford. Of these the Washington congress imposed exceptionally heavy responsibilities, including the burden of financing as well as the planning and execution of the program. Its success was due in no small degree to his personal efforts and influence.

Needless to say, Dr. Lipman led a very busy life and one which was highly productive. Not only Rutgers and New Jersey but the land-grant institutions as a national group may well take pride in his achievements, for he was a conspicuous representative of a class of youth with limited means and outlook which they were established to reach and serve. To Rutgers and Cornell he owed his sound technical training, the inspiration of such pioneers as Voorhees, Caldwell, and V. A. Moore, and the opening of the door of research opportunity. These debts he speedily repaid by his exceptional public service. So long as the land-grant institutions can develop and put to work investigators, educators, and administrators such as he, their usefulness in a democracy can be readily justified.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[**Chemical investigations by the Iowa Station**] (*Iowa Sta. Rpt. 1938, pts. 1, pp. 102, 123; 2, pp. 61–69, fig. 1*).—Research work on nitrogen and accessory growth factor requirements of bacteria, especially the lactic and propionic acid forms, by C. H. Werkman; and on development of the use of clay, particularly Iowa clay, for the clarification of sorghum sirup, by W. G. Gaessler and J. T. Lonsdale, is reported in part 1. In part 2, dealing with the Iowa Corn Research Institute, certain chemical and physical characteristics of corn as related to industrial utilization, oxidation of cornstarch, and identification of the compounds responsible for the odor of yellow corn are reported upon by R. M. Hixon; a characterization of the products of starch degradation by enzyme, by N. Naylor; physical properties of dextrose, by J. H. Buchanan; and utilization of agricultural products in the fermentative production of lactic acid, by Werkman.

[**Bacteriological chemistry investigations by the Wisconsin Station**] (*Wisconsin Sta. Bul. 442 (1938), pp. 62–64, 65–67*).—Lactic acid bacteria have been studied by E. E. Snell and F. M. Strong, butyric acid anaerobes by L. E. McDaniel and D. W. Woolley, fermentation of wood sugar liquor, by N. O. Sjolander, products of propionic acid bacteria by A. S. Phelps and M. J. Johnson, industrial production of lactic acid by S. C. Pan, enzymes of micro-organisms by J. Berger and Johnson, and physiology of anaerobic bacteria by E. McCoy, C. Lankford, Sjolander, and N. Rodgers; and yields of yeast, role of phosphorus, spoilage of bakers' yeast, and oxidation-reduction relationships, by D. Colingsworth, W. L. Owen, and I. L. Baldwin.

Some notes on the stability of dithizone solutions, P. A. Clifford. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 4, pp. 695–703, figs. 3*).—The instability of dithizone solutions in chloroform was found to be due to the decomposition of the solvent rather than to instability of the reagent itself. Solutions in purified chloroform stabilized by the addition of 1 percent of its volume of pure absolute alcohol. Chloroform solutions of the reagent kept well enough when stored in darkness and at a temperature of 40° F. to permit standard solutions to be prepared in considerable quantities and held for some time. Carbon tetrachloride, as well as chloroform, was improved by purification but added alcohol was not needed. Storage of carbon tetrachloride solutions of dithizone in the cold and dark under a layer of sulfur dioxide water of about 0.1 M strength will preserve them almost indefinitely.

A chemical examination of the lignin-like substance from the sporophores of Fomes pini (Thore) Lloyd (Trametes pini (Thore) Fr.), M. Phillips. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 4, pp. 678–684*).—The author isolated from the sporophores of *F. pini*, by extraction either with fuming hydrochloric acid or with diluted hydrochloric acid and ethylene glycol monomethyl ether and subsequent precipitation, a substance resembling lignin in some chemical reactions but differing from lignin of seed plants in being essen-

tially free from methoxyl groups. Results of chlorination, bromination, nitration, acetylation, methylation with diazomethane and with dimethyl sulfate, and alkali fusion are given.

The dehydrogenation of alkali lignin from corn cobs with selenium, M. PHILLIPS and M. J. GOSS. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 4, pp. 632–635*).—Alkali lignin from corncobs was distilled with selenium in an atmosphere of nitrogen. From the oil obtained guaiacol and 1-*n*-propyl-3-methoxy-4-hydroxybenzene were isolated and identified as their 3,5-dinitrobenzoyl esters. The neutral fraction of the oil consisted of a mixture of selenium-containing organic substances, which appeared to be mixtures of organic selenides. The fraction boiling between 155° and 160° C. was found to contain 80.71 percent (average) of selenium. There was also isolated a crystalline substance melting at 122° (corrected), which appeared to be identical with the one previously isolated from the oil obtained in the dry distillation of lignin from corncobs. No hydrocarbon that would throw light on the structure of lignin was isolated.

Seasonal variation in tannin content of Lespedeza sericea, I. D. CLARKE, R. W. FREY, and H. L. HYLAND. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 2, pp. 131–139, fig. 1*).—Because of its possible influence upon palatability to cattle and upon digestibility, the tannin content of the leaves of this forage plant was determined in cuttings taken each week from the end of May to the end of July.

Total tannin in the leaves increased from 7.5 to 18 percent, and fixable tannin increased from 3.8 to 11.6 percent. The last cutting (a decrease of the percentage of leaves from 61.6 to 42.8 being taken into consideration) contained about 2½ times as much total tannin and 3 times as much fixable tannin as the first cutting. Not only the quantity of tannin in the leaves but also the astringency of the tannin increased during spring and summer. The quantity of total tannin in the stems was relatively insignificant, ranging only from 1 to 1.6 percent. In the whole plant the percentages of total and fixable tannin were essentially constant except for the three earliest cuttings.

The formaldehyde precipitation method gave results differing by a constant factor from those obtained in total tannin determinations. It is therefore considered that under some conditions the formaldehyde method might be a convenient procedure for approximate estimations.

Further studies on the nature of Ricinus lipase and its action, H. E. LONGENECKER and D. E. HALEY. (Pa. Expt. Sta.). (*Jour. Amer. Chem. Soc., 59 (1937), No. 11, pp. 2156–2159, figs. 2*).—An arbitrary expression for comparing the lipolytic activity of preparations from the seeds of the castor-bean plant is based on the time required for 40 percent hydrolysis of an oil. Variation of the substrate concentration and the amount of water in the digestive mixture have shown the optimum conditions for *Ricinus* lipase action and the variance permissible for considerable action. Lipolytic action in the presence of a trace of water was observed and is considered to suggest the utility of the enzyme to the germinating seed. Inactivation of this enzyme by water was found to take place in the presence or absence of oil.

The effect of certain salts and cholesterol on the activity of Ricinus lipase, H. E. LONGENECKER and D. E. HALEY. (Pa. Expt. Sta.). (*Jour. Amer. Chem. Soc., 59 (1937), No. 11, pp. 2160, 2161, fig. 1*).—The effect of certain salts, chiefly chlorides and acetates, on the activity of *Ricinus* lipase was studied. All of these were found to retard or inhibit the normal action of the enzyme. Salts of copper, cobalt, and mercury showed the greatest inhibitory action. The least inhibitory effects were those of iron, lead, nickel, and zinc salts. Cholesterol

accelerated the action of the enzyme, indicating that a water-in-oil emulsion is desirable for its optimum activity.

[A. O. A. C. reports presented at the 1937 meeting] (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 4, pp. 531–533, 552–554, 594, 595, 596, 596–600, 614–618, 622–625*).—Reports on analytical methods and on collaborative studies of such methods have been reported from land-grant institutions as follows: Santonin, phenolphthalein, and calomel in tablets, and pyridium, both by H. J. Fisher (Conn. [New Haven]); feeding stuffs, by L. S. Walker (Vt.); stock feed adulteration, by P. B. Curtis (Ind.); mineral mixed feeds, by A. T. Perkins and J. F. Merrill (Kans.); hydrocyanic acid in glucoside-bearing materials, by R. A. Greene (Ariz.); and biological methods for vitamin B complexes, by C. A. Elvehjem (Wis.).

[Studies of chemical methods by the Cornell Station], B. L. Herrington, P. F. Sharp, V. N. Krukovsky, D. B. Hand, L. C. Norris, and A. Z. Hodson (*[New York] Cornell Sta. Rpt. 1938, pp. 106, 107, 147, 148*).—Procedures for determining the total-solids content of milk from the fat and specific gravity, factors involved in the determination of moisture in milk products, a seeding test for the detection of crystalline β-lactose, a quantitative method for determining the relative amounts of α- and β-lactose in dried milk and whey, a method for more satisfactory analysis of composite samples by the Babcock test, and methods for determining the riboflavin content of feedstuffs are briefly noted.

Influence of arsenical treatments upon rapid tests for soil phosphorus, M. S. Anderson and J. W. Bengtson. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 10, pp. 844–846*).—The authors show that where lead arsenate has been applied in large quantities or repeatedly, as in Japanese beetle control, rapid test methods for determining soil phosphate requirement will give high results for phosphate content. From the data presented "it is evident . . . that the relative quantities of phosphorus or arsenic, or both, dissolved by the different extracting solutions vary somewhat but show the same general trends. It is clear, also, that rapid tests for phosphorus, as ordinarily conducted, are meaningless when soils have received any kind of arsenical treatments."

Determination of chlorate in soil extracts, culture solutions, and plant sap, R. S. Rosenfels. (Calif. Expt. Sta. and U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 4, pp. 665–674*).—The first of the two methods reported upon is based upon the reduction of chlorate to chloride by sulfurous acid. The chloride is determined before and after reduction by titration with silver nitrate, the difference being a measure of the amount of chlorate. Recovery tests on known amounts of chlorate show that the method gives reliable results on soil extracts. A shorter procedure is based upon the reduction of chlorate by hydriodic acid followed by titration of the resulting ioline with thiosulfate. Recovery tests showed that this method is not suited to the analysis of soil extracts but gives reliable results on culture solution. It was also satisfactory for the analysis of xylem sap of squash.

Determination and occurrence of boron in natural phosphates, superphosphates, and defluorinated phosphate rocks, L. F. Rader, Jr., and W. L. Hill. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 12, pp. 901–916, figs. 2*).—The authors have so far modified the methyl ester distillation method as to permit titration with a single indicator (phenolphthalein) instead of two indicators. The boron contents (acid-soluble boron (B_2O_3)) as thus determined are given for 54 samples of natural phosphates from various deposits of the world as ranging from <10 to 144 p. p. m., in 9 samples of superphosphates from <10 to 158 p. p. m., and in 3 samples of defluorinated phosphate rock from 20 to 30 p. p. m.

Concerning the Dyer method for the identification and determination of volatile fatty acids, E. P. CLARK and F. HILLIG. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 4, pp. 684–688, figs. 3*).—A critical study of the method has revealed that the distillation constants of the various acids depend largely upon the size and design of the apparatus, as well as upon the rate of distillation. "The values recorded by Dyer [E. S. R., 37, p. 13] are obtained, therefore, only under the exact conditions used by him, and since the instructions given in his paper are inadequate, his results are not reproducible."

The authors present a fully dimensioned diagram of a distillation apparatus giving reproducible results, specifying not only dimensions of all parts affecting the distillation rates but also the angles of bends in the connecting tubing. Steam is obtained from a 3-l. Erlenmeyer flask provided with an immersed 25-ohm coil of No. 30 Chromel wire connected in series with a 23-ohm variable resistance for accurate control of the rate of steam elevation. These heating unit and resistance specifications are for 110 v.

Application of the Scales method to determination of sugar in plant juices and tissues, W. R. ROY *and* A. E. HUGHES. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 4, pp. 636–645, figs. 2*).—The Benedict alkaline copper solution is used, the cuprous oxide being oxidized by a known excess quantity of standard iodine solution in the presence of hydrochloric acid in the original reaction mixture, in which also the back titration of the excess iodine with standard thiosulfate solution is carried out.

The sodium thiosulfate-sugar equivalent was determined by means of regression lines of volume of sodium thiosulfate on milligrams of dextrose and sucrose, covering the range considered. A statistical study of these ratios showed them to be linear. A method for the determination of the blank, based on the fact that linear regression lines were obtained, was developed. The effect of period of boiling on the amount of sugar recovered was studied, the optimum time of actual boiling having been found to be 3 min. Back oxidation was controlled during cooling by minimum agitation of the flask in which the determination was being made. A statistical study of the error in the amount of sugar, estimated at various concentrations and covering the entire range of the method, showed that the method is reliable between the limits 4–18 mg. of sugar. A statistical comparison of the Scales method as modified and the standard method of Munson and Walker, as applied both to pure sugar solutions and to fruit juices, showed equal accuracy.

An improved technic in the toluene distillation method for the determination of moisture in foodstuffs, J. A. DE LOUREIRO (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 4, pp. 645–648, fig. 1*).—Satisfactory results are obtained with the Bidwell and Sterling direct method for water estimation (E. S. R., 53, p. 805) under the following conditions: (1) An apparatus allowing a flow of liquid in the same direction as the flow of vapors must be used. (2) The collecting tube must be rinsed with a strongly alkaline solution before the estimation is begun. (3) Liberation of volatile fatty acids must be prevented by the addition of a small quantity of anhydrous disodium phosphate. A dimensioned diagram shows the construction of the apparatus necessary for this modification of the method.

A note on the bioassay technique for determining available iron in foods, P. L. HARRIS and G. L. POLAND (*Food Res., 3 (1938), No. 4, pp. 383–388, fig. 1*).—Data are presented confirming the recommendations of Smith and Otis (E. S. R., 78, p. 888) for the modification of the Elvehjem and Kemmerer bio-assay procedure (E. S. R., 67, p. 90) for determining available iron in foods of low iron content.

The chemical determination of soundness in corn, L. Zeleny and D. A. Coleman (*U. S. Dept. Agr., Tech. Bul. 644 (1939), pp. 24, figs. 3*).—It has been shown that the quantity of free fatty acids, amino acids, and acid phosphates in the kernel tend to increase as deterioration progresses. Only the fat acidity, however, increases significantly with incipient deterioration and is therefore the only type of acidity which appears to be useful in differentiating degrees of soundness in corn. For the samples included in this study the average increase in fat acidity between grades No. 1 and No. 2 is 20 times as great as the average increase in phosphate acidity and 59 times as great as the increase in amino acidity. Fat acidity based on the sample as a whole appears to be a more reliable index of soundness than fat acidity based on the extracted fat.

A soundness score has been devised as a mathematical expression based on a percentage of damaged kernels, germinability, fat acidity, amino acid acidity, and phosphate acidity as criteria of soundness. In a series of 244 samples of corn, fat acidity values correlated more closely with the soundness score than did the percentages of damaged kernels.

A rapid method of determining fat acidity has been devised by which 75 to 100 determinations may be made in a 7-hr. day by an analyst with the aid of one nontechnical assistant, the method thus being usually more rapid than the damaged-kernel method.

A chemical procedure for evaluating spoilage in canned fish, especially salmon and tuna fish, F. Hillig and E. P. Clark. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 4, pp. 688–695, fig. 1*).—The authors found the production of volatile acids to be characteristic of the spoilage in question and adapted the Dyer method (E. S. R., 37, p. 13) to the purpose of obtaining an index of the degree of spoilage.

"A critical examination of the extensive data accumulated shows that for practical diagnostic purposes it is not necessary to determine the entire quantity of acid in a sample, nor is it necessary to identify all the components of the mixture. What is essential is to determine accurately a definite proportion of the total acids which has been called the volatile acid number, and the quantity of formic acid in this fraction, designated as the 'formic acid number.'"

The preparation of samples of canned dog food for chemical analysis, C. J. Koehn (*Alabama Sta. Rpt. 1937, p. 24*).—A method devised by the station is described.

Observations on the determination of ash in feeding stuffs, J. W. Clulow (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 4, pp. 674–678*).—The author notes that although the proportion of calcium carbonate used in a mixed feed is usually small, it may amount to from 15 to 30 percent of the ash, making uniformity in the decomposition of the carbonate essential to uniformity of ash determination results. He found that oven control is erratic at 550° C., the decomposition of the calcium carbonate ranging from 17 to 100 percent. A temperature of 650° maintained for from 15 to 18 hr. or a temperature of 700° maintained for 2 hr. gave more uniform results, "but there is still considerable room for improvement."

The colorimetric determination of pH in milk and whey by means of the "Wulff" pH tester, R. Aschaffenburg (*Jour. Dairy Res. [London], 9 (1938), No. 3, pp. 336–338*).—A comparison of pH values for milk and whey obtained by the Wulff colorimetric and potentiometric methods is reported. Good agreements of values were obtained for the whey, while somewhat wide variations occurred with milk. The value of the colorimetric method for following pH changes in whey during cheese manufacturing is suggested.

The estimation of sulfanilamide in milk, H. BAUER and M. F. GUNDERSON. (Univ. Nebr.). (*Cornell Vet., 28 (1938), No. 4, pp. 299–304, fig. 1*).—It was found that sulfanilamide in the milk of goats or cows can be estimated by the method described by Fuller in 1937 (E. S. R., 77, p. 849). The errors encountered by this method ranged from 0.4 to 4 percent, but the results with human milk were disappointing. "Duplicate milk samples containing known amounts of sulfanilamide and the requisite amount of trichloracetic acid when held at refrigerator temperature for a period of 24 hr. checked within 0.4 to 4 percent. Likewise duplicate samples which did not contain trichloracetic acid but were held in the refrigerator for 24 hr. checked within 0.6 to 4 percent. Determinations made immediately on duplicate milk samples containing known amounts of sulfanilamide checked within 1 to 4 percent. The results obtained would seem to indicate that neither the addition of trichloracetic acid nor the holding of the milk samples at refrigerator temperature for 24 hr. markedly interferes with the accuracy of the test. Of the 23,349 mg. of sulfanilamide fed to the goat, only 79.054 mg. were recovered at the end of 60 hr. . . . Of the several hundred sulfanilamide determinations made on herbivore milk samples no technical difficulties were encountered using Fuller's modified method."

Use of phenol in application of Prebluda-McCollum reagent for determining vitamin B_1, D. MELNICK and H. FIELD, JR. (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 723–725, fig. 1*).—The authors have found that xylene quantitatively extracts the pigment formed in the color test for vitamin B_1 described by Prebluda and McCollum (E. S. R., 77, p. 151), and that in the presence of phenol there is a marked increase in the sensitivity of the reaction, the xylene later becoming intensely pigmented. The quantities of the various reagents used in the test were 100γ of thiamine chloride in 10-cc. solution at pH 7, 20 cc. of the Prebluda-McCollum reagent, and 50 mg. of phenol. After 24 hours' standing at room temperature, 2 cc. of the xylene is added, the mixture is shaken vigorously for 1½ min., centrifuged, and the color of the xylene layer then compared in a microcolorimeter with a standard similarly treated. The intensity of color in the presence of phenol has made possible a micromethod, using $\frac{3}{10}$ quantities of the vitamin solution, phenol, and color reagent, but the original quantity of xylene. By this procedure it is said to be possible to determine accurately the vitamin B_1 concentration in solutions containing as little as 10γ total of thiamine chloride. The reaction in its present form cannot be applied as yet to biological materials unless quantitative procedures for the preparation of suitable concentrates are first devised.

Use of cyanide in the determination of ascorbic acid, M. CUSHMAN and A. M. BUTLER (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 3, pp. 534–539*).—Conflicting views as to the advisability of adding KCN to blood samples to be used in the determination of ascorbic acid have led to a reinvestigation of the effect of KCN on 2,6-dichlorophenolindophenol and the stability of reduced ascorbic acid in whole blood, plasma, and plasma filtrate, with the finding that KCN may or may not invalidate the results, depending upon the concentration of the salt and the pH of the dye-salt solution. It was also demonstrated that reduced ascorbic acid is stable in whole blood or metaphosphoric acid plasma filtrates for as long as 24 hr., but that there is a significant loss when plasma stands at room temperature for more than 4 hr. and that this loss is not prevented by the presence of KCN in the concentrations recommended. The authors conclude that there is no reason for the addition of potassium cyanide in the determination of plasma ascorbic acid by the methods tested.

Direct reading catalase test tubes, E. R. CARLSON. (Wis. Expt. Sta.). (*Cornell Vet., 28 (1938), No. 4, pp. 331–339, figs. 4*).—Two forms of a direct read-

ing catalase test tube are described and illustrated. The capillary type is designed for field use, while the other is especially suited for the laboratory. Both types have the innovation of a scale for direct reading of the percentage of oxygen gas without resorting to computation. The laboratory type in addition makes use of a pigmented agar indicator to facilitate reading. Methods of determining percentages higher than 200 percent with the use of the laboratory type test are described. Both types are designed to facilitate self-measurement of fluids used in the catalase test.

Photo-colorimetric method for the determination of androsterones in urine, R. NEUSTADT (*Endocrinology, 23 (1938), No. 6, pp. 711–717, figs. 2*).—A photo-colorimetric method is described for the determination of androsterones in urine.

Keeping quality of crackers improved by antioxygen, H. O. TRIEBOLD. (Pa. Expt. Sta.). (*Food Indus., 10 (1938), No. 2, pp. 71, 111, 112*).—Oat flour and its extracts were found to have some antioxidant properties, inhibiting for a time the oxidative deterioration of crackers stored at elevated temperatures. It was found that the best way to add the antioxidant is to spray the crackers with the extract immediately upon their removal from the oven. Dusting the crackers with oat flour just previous to baking also aided in retarding rancidity development.

Potato by-products studies, C. A. BRAUTLECHT (*Maine Sta. Bul. 391 (1938), pp. 305, 306*).—Studies, principally concerned with starch production problems and including analyses, are reported.

[Better prune products] (*Oregon Sta. Circ. 130 (1938), pp. 44, 45, figs. 3*).—This is a brief general article containing notes on five new prune products. These are canned dried prunes, prune juices, prune pulp, dried prune halves, and dried prunes in small packages. The desirability of a quality standard to replace the present size standard is also pointed out.

List of publications on pulp and paper. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1938, pp. [2]+19*).—Technical notes, reprints, mimeographed reports, etc., obtainable upon request from the Forest Products Laboratory at Madison, Wis., as long as available, are listed.

***List of references to the literature on tall oil* (tallol, liquid rosin, pine oil, or black liquor soap),** M. W. BRAY, J. S. MARTIN, and L. H. SMITH. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1938, rev., pp. [1]+9*).—This list contains 98 references, mostly to foreign publications, of which a considerable number report Swedish work on this material. A brief account is appended of the manufacture, constituents, purification, and uses of liquid rosin or tall oil (Swedish "tall" equals pine).

AGRICULTURAL METEOROLOGY

Weather, G. PICKWELL (*Los Angeles: Hugh F. Newman & Co., 1937, pp. X+170, [figs.] 59*).—This popular treatise discusses the subject under the headings: Why study weather, what makes the weather (sun, air, water, cyclones and anticyclones, and cyclones and seasons), signs of the weather (clouds, winds, and lightning), the work of the weather (by winds, water, and sun), what man does about the weather (recording and predicting the weather, and control of wind, floods, erosion, and frost), and learning the weather (by younger and older students).

The daily exploration of the atmosphere by radiosond [trans. title], R. BOURGEOIS (*Compt. Rend. Acad. Sci. [Paris], 207 (1938), No. 15, pp. 611–613*).—The author describes and discusses the meteorological application of the radiosond

balloon to the instantaneous recording of temperature, pressure, and humidity data from high atmospheric altitudes.

Structure of the lower stratosphere [trans. title], V. Mironovitch and A. Viaut (*Compt. Rend. Acad. Sci.* [*Paris*], *207* (*1938*), *No. 19, pp. 866–869, figs. 2*).—The authors examine certain theories of the structure of the tropopause on the basis of information from daily temperature soundings. The effect of invasion by polar air originating in latitude 50° and reaching latitude 35° is examined, curves from actual soundings being compared with theoretical data, and a similar study is made of invasion by tropical air, with corresponding curves. The effects of such invasions are discussed, with particular reference to what the authors call the division ("dédoublement") of the tropopause. This effect is said to be very often a sign that a change in type of weather is in progress.

Atmospheric ozone as a constituent of the atmosphere, B. Haurwitz (*Bul. Amer. Met. Soc.*, *19* (*1938*), *No. 10, pp. 417–424, fig. 1*).—This is a review, with 16 references.

The vertical distribution of atmospheric ozone [trans. title], F. W. P. Götz (*Ergeb. Kos. Phys.*, *3* (*1938*), *pp. 253–325, figs. 51*).—This monographic review of the subject (196 references) considers the advances in the principles and methods of reckoning and measuring ozone, determination of its vertical distribution, theories of its vertical distribution, and the results of such distribution, including its relations to ultraviolet radiation, to temperatures in the higher atmosphere, and to the weather.

Agricultural meteorology: Some characteristics of winds in Alberta and Saskatchewan, J. W. Hopkins (*Canad. Jour. Res.*, *17* (*1939*), *No. 1, Sect. C, pp. 4–24, figs. 7*).—Over a period of years the monthly mean mileage of wind per day, April to September, at four meteorological stations in central and southern Alberta and Saskatchewan was greatest in April and May and least in July and August. The range of variations of the monthly means was considerable (order of 50 percent). Significant correlation in the interannual fluctuations at these stations was not demonstrable from the available data, but there was some indication of correlation between the mileages at a given station in successive months of the same year. Over the season as a whole northwesterly winds predominated, but in this respect too there were pronounced annual variations. Variation in the amount of wind from day to day within months was also pronounced, and tables show for each of the 6 mo. the relative frequency of occurrence of different daily mileages. On the whole, more wind was recorded during the day than the night. Hourly averages for all 6 mo. showed a definite diurnal trend, the maximum being around 3 p. m., but the actual hourly sequence on a given day might deviate markedly from this underlying regularity. There was a slight tendency for days of above-average temperature to have higher wind mileage, but this was a minor factor compared with the uncorrelated variation of both quantities.

Evaporation in agricultural meteorology, T. Alty (*Canad. Jour. Res.*, *17* (*1939*), *No. 1, Sect. C, pp. 1–3, figs. 2*).—Data are presented emphasizing the fact that in order to relate the evaporation rate to other meteorological factors, the temperature of the evaporating liquid surface as well as that of the air must be known, and that the measurement of such temperatures at agricultural meteorological stations would be valuable. As the evaporation process itself cools the surface, its temperature is never equal to that of the liquid as a whole. It is suggested that a good approximation of the required surface temperature could be obtained by floating a thermometer horizontally in the surface of the liquid.

Schroeder; soil management studies in orchards, by Merkle and N. J. Shaulis; and nitrogen fixation in the soil, by White, J. J. Reid, Holben, and A. C. Richer.

[Soil investigations by the South Carolina Station] (*South Carolina Sta. Rpt. 1938, pp. 41–45, 131, 132, 150, 151, figs. 4*).—The effect of cropping practices on erosion and the run-off from different soil types are noted by T. C. Peele and F. Moser. Fertilizer placement is taken up by W. M. Lunn and J. R. Mattison (coop. U. S. D. A.), and lysimeter investigations by N. McKaig, Jr., and E. M. Roller.

[Soil investigations by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1937, pp. 20–22, 23, 24, 121–123, 176–179, 197, 198, 223–227*).—The following subjects are reported upon: Composition of soils and the relation of soil composition to plant and animal deficiencies, both by G. S. Fraps and J. F. Fudge; fertilizers affect composition of soils, by Fraps, Fudge, and E. B. Reynolds; the fixation of phosphate from dipotassium phosphate solution, by Fraps and P. Macy; and nitrification, by Fraps and A. J. Sterges.

Notes are given on a soil survey of Fannin County made by E. H. Templin et al.; of Dimmit County, by H. M. Smith et al.; and of Brown County, by W. I. Watkins et al.

Soil and water conservation investigations included experiments on soil and water losses, strip cropping, the effect of slope characteristics on soil and water losses, the effect of plant cover, burning woods, and terrace characteristics on soil and water losses, by J. B. Pope, O. C. Ward, and J. C. Acher. At the Temple Substation this work included general control plat work, terrace investigations, strip cropping investigations, and protection of eroded lands by revegetation, all by H. O. Hill. At the Spur Substation soil and water conservation studies were made with control plats, field areas, the sirup pan terrace system, pasture improvement, and buffalo grass selections, all by R. E. Dickson, B. C. Langley, and C. E. Fisher.

[Soil investigations by the Wisconsin Station] (*Wisconsin Sta. Bul. 442 (1938), pp. 59–61, fig. 1*).—These have been concerned with excretion of nitrogen from legume roots, role of bios, "hydrogen bacteria" and soil fertility, and vitamins for legume bacteria, all by P. W. Wilson, R. H. Burris, O. Wyss, P. M. West, S. Lee, and E. B. Fred.

[Soil Survey Reports, 1934 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1934, Nos. 12, pp. 41, figs. 5, map 1; 13, pp. 24, pls. 2, figs. 2, map 1*).—These surveys were made in cooperation with the respective State experiment stations: Nos. 12, Kitsap County, Wash., R. Wildermuth et al.; and 13, the Price area, Utah, F. O. Youngs and D. S. Jennings.

A method for obtaining a continuous measurement of soil moisture under field conditions, G. J. BOUYOUCOS and A. H. MICK. (Mich. Expt. Sta.). (*Science, 89 (1939), No. 2307, p. 252*).—The moisture content of a standardized block of $CaSO_4$ (gypsum) buried in the soil varies directly with that of the soil and may be measured by determining the electrical conductivity of the block by means of electrodes and a form of the Wheatstone bridge. A high degree of accuracy is reported.

***Erosion and related land use conditions on the Elm Creek watershed,* Texas,** H. OAKES and E. SOMERVILLE (*U. S. Dept. Agr., [Soil Conserv. Serv.], 1939, pp. 20, pls. 5, fig. 1, maps 2*).—Conditions on this watershed, which comprises 159,195 acres all in farms, 84 percent cultivated, and affected by erosion damage ranging from slight to very severe, are described. The survey shows that 137,053 acres have been affected by accelerated water erosion, 50,442 acres slightly, 52,674 acres moderately, 20,200 acres severely, and 13,737 acres very severely eroded and essentially ruined for further cultivation. Control and recovery methods of the usual type are recommended.

The accuracy of the plate count of suspensions of pure cultures of bacteria in sterile soil, M. SUTHERLAND and N. JAMES (*Canad. Jour. Res., 16 (1938), No. 8, Sect. C, pp. 305–312, figs. 3*).—A culture of *Pseudomonas fluorescens* was suspended in a sterile soil and water mixture. Dilutions of 1:2,000,000 and 1:10,000,000 were plated in four replicates of each dilution, nutrient agar being used. This was repeated 200 times. A χ^2 value was calculated from each set of four counts. The distribution of the 200 χ^2 values in the platings from each dilution agrees very well with the theoretical distribution. In a second experiment, 100 sets of four replicates of *P. fluorescens* were plated along with 100 of *Bacterium globiforme* and 100 of a mixture of the two cultures. The distribution of the χ^2 values in each of the three sets was such that the values could be considered to have been derived from populations distributed according to the Poisson series. The close conformity of the distribution of the actual χ^2 values to that of the expected in each of the five sets of data indicated that the mean of four replicates is reliable as an estimate of the population in the dilution plated, and further that the failure to obtain this conformity with soil flora is due to causes other than technic.

Effect of certain crops and soil treatments on soil aggregation and the distribution of organic carbon in relation to aggregate size, W. H. METZGER and J. C. HIDE. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 10, pp. 833–843, fig. 1*).—Soil under growing corn and kafir in field and greenhouse showed as good aggregation under the sorghum crop as under corn. When oats succeeded these two crops in the field, however, soil samples from the oats stubble showed a greater degree of dispersion following sorghum than where corn was grown the preceding crop. Sweetclover left the soil better aggregated after 1 year's growth than did soybeans, while alfalfa and sweetclover gave similar results. Soil fallowed for 2 yr. in the field was less aggregated than soil fallowed for 1 yr. Limed soil under sweetclover and red clover in a greenhouse experiment was more highly aggregated than unlimed similar soil under these crops. Unlimed and unleached fallow soil in the greenhouse was as well aggregated as limed fallow soil. It is suggested that perhaps the combined action of lime and a legume crop, or possibly other crops, produces an aggregating force which lime alone does not exert. "The grasses failed to produce the aggregation of the soil expected of them, but their failure in this experiment may have been due to the shortness of the growth period."

Greenhouse soil management, E. C. STAIR. (Purdue Univ.). (*Ind. State Veg. Growers' Assoc., [Ann. Rpt.], 9 (1938), pp. 17–23*).—This general discussion points out some advantages of a sandy soil for greenhouse vegetable growing and taking up methods of watering, prevention of "buckeye rot" by avoiding the splashing of soil onto leaves and fruit during watering, maintenance of organic matter supply, use of commercial fertilizers, sterilizing soils, etc.

Fertility studies on Dekalb soil and their application to farmland in Pennsylvania, J. W. WHITE, F. J. HOLBEN, C. D. JEFFRIES, and A. C. RICHER (*Pennsylvania Sta. Bul. 370 (1939), pp. [3]+48, figs. 12*).—The area on which the plat experiments were located in Snow Shoe Township, Centre County, showed a weighted crop yields index of 76.6 compared to 94.8 percent for the average of the entire Dekalb farm land of the State. The experiments were started in 1916 and included 40 plats divided into 4 fields, 3 in a 4-yr. grain rotation and 1 in permanent pasture. The land was classified as submarginal land and had been abandoned for approximately 40 yr.

The economic returns indicated that this type of farm land is capable of profitable production under a system of farm management including the systematic use of lime, commercial fertilizers, and manure. In the production of pasture

grasses, the L+PKN treatment showed the maximum improvement. If L+PKN is expressed as 100 the relative returns were from L+P 66, from L+PK 88, and from L+MP 74. The relative crop-producing values of P, K, and N for the pasture plats were P 60, K 20, and N 20. The economic returns from 16 yr. of liming were similar in the case of limestone and hydrated lime. Based on the more economical fertilizer treatments previously indicated, the yields of crops at Snow Shoe were raised from a weighted crop yields index of 76.6 to a crop-producing value of 113 (the State average being taken as 100).

Results with potash in eastern Virginia, J. B. Hester and J. M. Blume. (Va. Truck Expt. Sta.). (*Better Crops With Plant Food, 21 (1937), No. 6, pp. 9–12, 37–39, figs. 5*).—The available potassium test is less convenient than those depending on color reactions but was found capable of separating soils into groups containing, respectively, 100 lb. or more, between 40 and 100 lb., and less than 40 lb. of readily available potash per acre. Both greenhouse and field plat tests supported, in general, the conclusions indicated by the cobaltinitrite turbidity test made on an extract obtained by the treatment of a soil sample with an acetic acid-sodium acetate solution buffered at pH 5.0.

Replacement of calcium in soils by sodium from synthetic irrigation water, G. S. Fraps and J. F. Fudge. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 10, pp. 789–796*).—Calcium chloride and sodium chloride, in equal equivalent concentration and together equivalent to the exchangeable hydrogen in a hydrogen-saturated soil, replaced about 20 percent of the exchangeable hydrogen. Calcium absorbed represented about 75 percent of this quantity, and was thus three times as active as sodium in replacing hydrogen.

When 50 gm. of soil were shaken with 200 cc. of solutions containing 2.5, 5, 7.5, and 10 milligram equivalents of sodium chloride, the average net increase in calcium content of the solutions was equivalent to 36, 32, 30, and 30 percent, respectively, of the sodium originally present. The addition of 5 m. e. of calcium chloride to the solutions caused a decrease in net calcium of about 50 percent of that found in the solutions containing sodium chloride alone. When sodium bicarbonate was used instead of sodium chloride, the net calcium was very small and decreased with an increase in bicarbonate concentration.

Replacement of calcium from soil receiving a second shaking with solutions containing sodium chloride and calcium chloride was equal to about one-third that in the first shaking, while that in the case of soil shaken three times was less than one-fifth of that in the first shaking. A single shaking with a concentrated solution replaced about one-third more calcium than was replaced by the same quantity of salt applied in three shakings.

Calcium replaced by solutions containing 3.5 m. e. of sodium chloride and 0, 1.75, 3.5, 5.25, and 7 m. e. of calcium chloride was equivalent to 39, 26, 22, 18, and 14 percent, respectively, of the sodium chloride present. Calcium replaced by solutions containing 1.25 m. e. calcium chloride and varying quantities of sodium chloride per 100 cc. in six successive percolates represented 55, 31, 21, 11, 8, and 4 percent of the sodium chloride originally present.

Fertilizer-lime and crop rotation experiments, W. H. Rankin. (N. C. Expt. Sta.). (*Com. Fert., 57 (1938), No. 5, pp. 8–10*).—The author states some general results of long-period experiments at the Piedmont Substation.

Lime, while necessary for clover and beneficial for most legumes, increased the severity of cotton rust and of the "frenching" disease of corn when from 3 to 4 tons per acre were applied during 10 yr. The addition of 1 ton per acre every fourth year in a 4-yr. rotation gave the soil a poorer physical condition than that found where lime was not used. Nitrogen was needed for all crops in the rotation. Heavy phosphating or the use of phosphate with lime produced results similar to

those of overliming. Phosphates were needed, however. Continued application of potassium compounds only lowered the yields, but some potassium was needed to prevent the corn and cotton diseases mentioned. Complete fertilizers were more effective than incomplete mixtures or single fertilizer elements. Recommendations for specific crops on each of seven groups of Piedmont soils are offered.

Minor elements and major soil problems, L. G. WILLIS and J. R. PILAND. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 11, pp. 885–894, figs. 3*).—"The perspective introduced into soil fertility experimentation by research on the functions of the so-called minor elements directs attention to the defects in the interpretations of prior work. The scientific objective of modifying single independent variables is demonstrated to be unattainable in fact even though it has been made the basis of all fertilizer experiments. The interpretations of such experiments are therefore subject to unavoidable errors, and practical applications derived from them are in some degree empirical. Recognition of this fundamental limitation constitutes the first step in increasing the efficiency of fertilizer usage. Further progress must depend upon accidental discovery or upon a more rational development of experimental procedure."

The minor elements in soil fertility and plant nutrition, W. L. POWERS (*Oregon Sta. Circ. Inform. 192 (1938), pp. 5+[3], figs. 7*).—A brief discussion of the possibilities of manganese, zinc, tin, boron, copper, and iodine in improving yields or preventing deficiency diseases is accompanied by description and illustration of some crop nutrition experiments with these elements.

The value of a ton of farm manure in the North Platte Valley, L. HARRIS. (Coop. U. S. D. A.). (*Nebraska Sta. Bul. 318 (1938), pp. 20, figs. 2*).—The rotation and manure experiments indicated a high residual value for manure, showing that heavy applications each year are not necessary to maintain yields at satisfactory levels. Good yields for a period of 25 yr. were obtained in a 6-yr. rotation of potatoes, oats, sugar beets, and 3 yr. of alfalfa, with a 12-ton application of manure to the sugar beet crop. It is estimated, on the basis of data on manure production by farm animals in the North Platte Valley, that the feed produced in this type of rotation is sufficient for the livestock required to produce the 2-ton per acre equivalent annual application of manure. Where a 4- or a 6-ton per acre annual application of manure is required for the whole area of a farm, as in 3-yr. and 2-yr. rotations, enormous numbers of livestock are needed to produce the required manure. Furthermore such rotations produce very little feed for livestock. The 6-yr. rotation, in which 50 percent of the land each year has been in alfalfa, has proved to be the most practical, from the viewpoint of a manure-livestock-feed relationship. It has also been found to be one of the most desirable rotations from the standpoint of the control of potato diseases.

Increases in the present population of livestock in the North Platte Valley ranging from 90 percent in 6-yr. rotations to 370 percent in 2-yr. rotations appeared to be necessary for the maintenance of the productivity of the soil on the basis of the rotation experiments.

AGRICULTURAL BOTANY

[Botanical studies by the Iowa Station]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1938, pts. 1, pp. 109–112, 113, 114; 2, pp. 48–51*).—In part 1, brief reports are given on studies of the structure of seed-coat and environal factors pertaining to germination of weed seeds, by J. N. Martin; distribution and ecology of plants in the waterfowl breeding areas of Iowa, by A. Hayden;

and the relation of plant cover to erosion control, by J. M. Aikman and A. F. Dodge.

In part 2, brief reports are included on a comparative study of the stem and root development of some of the varieties of field corn grown in Iowa, as to the anatomical features manifested at successive stages of development, by Martin; translocation gradients in the corn plant and their relation to photosynthesis and yield, by W. E. Loomis; and measurement of the limiting environmental factors in the growth of the corn plant at different rates and spacings, by Aikman.

[Botanical studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1938, pp. 100, 101, 102, 110*).—Progress reports are included on stomatal behavior and rate of photosynthesis in strains of corn, by O. F. Curtis, D. G. Clark, J. I. Shafer and R. A. Emerson; translocation of solutes in plants—tissues concerned in translocation and factors influencing the rate and direction of movement, by Curtis and R. Shurtleff; requirements for the storage and germination of seeds of various aquatic plants, by W. C. Muenscher and O. L. Justice; and influence of X-rays on the growth and metabolic processes in ferns, by L. Knudson and G. R. Mandels; and bacterial physiology and fermentation, by O. Rahn and J. M. Sherman.

Advances in botany, edited by F. von Wettstein (*Fortschritte der Botanik. Berlin: Julius Springer, 1938, vol. 7, pp. IV+339, figs. 23*).—Surveys are included of the literature in the fields of morphology, systematics and phylogeny, physiology of metabolism, physiology of organ formation, and ecology.

Plant form and function, F. E. Fritsch and E. J. Salisbury (*London: G. Bell & Sons, 1938, pp. VIII+668, figs. 445*).—As the title implies, this textbook, intended not only to cover the first year university syllabus but also to provide an adequate foundation for a nonspecialized graduate course, includes the fundamental knowledge regarding morphology and anatomy and also the physiological and ecological aspects of plant life. There is a chapter on the British flora, and brief accounts of additional families are introduced to include all those to which frequent reference is made in the text. An especially adequate index is included.

The structure of economic plants, H. E. Hayward (*New York: Macmillan Co., 1938, pp. X+674, pl. 1, figs. 340*).—In this book the available data have been freely drawn upon, and selected literature citations appear at the conclusion of each chapter. The material is organized in two parts, viz, general plant anatomy, and the structure of a selected number of economic plants representing 13 families (corn, wheat, onion, hemp, beet, radish, alfalfa, pea, flax, cotton, celery, sweetpotato, potato, tomato, squash, and lettuce). A glossary and an index are provided.

Introduction to the botany of field crops.—I, Cereals. II, Non-Cereals, J. M. Hector (*Johannesburg: Cent. News Agency, Ltd., [1936], vols. 1, pp. XXXIV+478, figs. 190; 2, pp. XXXIII+479–1127, figs. [258]*).—This monographic text presents and copiously illustrates anatomical data on the roots, stems, leaves, and inflorescences of the plants included, their sex expression and pollination, organization of the ovule and fertilization, the fruit and seed, chromosome numbers and behavior, classification, and other general information. Keys are provided, bibliographies terminate the chapters, and each volume is provided with author, plant, and general indexes. Volume 1 includes members of the Gramineae (the small grains, millets, sugarcanes, sorghums, and maize), and volume 2 members of the Liliaceae (onions and asparagus), Moraceae (hemp and hops), Polygonaceae (buckwheat family), Chenopodiaceae (beet family), Cruciferae, Leguminosae, Linaceae (flax), Malvaceae (cottons), Umbelliferae,

Convolvulaceae (sweetpotato), Solanaceae (potato, tomato, tobacco), Curcurbitaceae, and Compositae.

Botanical dictionary, F. Saftenberg, rev. by F. Heilig (*Botanisches Wörterbuch. Leipzig: Hachmeister & Thal, 2. ed., rev., pp. 176*).—The taxonomic position, derivation, and common names are indicated for generic and species names, with accent indicated. A separate index to German common names is also provided.

Selected list of references on microbiology, compiled by H. F. Smart (*U. S. Dept. Agr., Bur. Chem. and Soils, 1938, pp. 5*).—Books are listed under eight categories, viz, general and systematic, medical, industrial and agricultural, and veterinary bacteriology, laboratory methods, microbiology of foods, yeasts and molds, and microbiological books dealing with bacterial chemistry and metabolism.

Submicroscopic morphology of protoplasm and its derivatives, A. Frey-Wyssling (*Submikroskopische Morphologie des Protoplasmas und seiner Derivate. Berlin: Borntraeger Bros., 1938, pp. XIV+317, figs. 138*).—The subject matter is discussed under the principles involved, including the theories of phase, structure, and micelles; the minute structure of protoplasm, including the cytoplasm, nucleus, and chloroplasts; and the minute structure of plasma derivatives, including structural elements and reserve materials.

Fundamental principles of bacteriology, with laboratory exercises, A. J. Salle (*New York and London: McGraw-Hill Book Co., 1939, pp. XIII+679, figs. 215*).—This is a general textbook on bacteriology, including the yeasts, molds, and viruses, with chapters on microbiology in agriculture and industry and in relation to diseases in plants, animals, and man.

An introduction to industrial mycology, G. Smith (*London: Edward Arnold & Co., 1938, pp. XII+302, figs. 127*).—In this textbook sufficient general mycology is included to orient the student, but the major portion consists of descriptions and illustrations of most of the genera of molds which occur regularly in industrial products, with more detailed consideration of the most important genera. Six chapters deal directly with the main taxonomic groups of molds, while single chapters concern laboratory equipment and technic, physiology of mold fungi, maintenance of a culture collection, control of mold growth, and industrial uses of fungi, respectively. Literature references terminate the individual chapters, while a chapter is devoted to the general mycological literature, and an index is provided. The foreword is by H. Raistrick.

The occurrence of mycorrhizae, considered systematically, with special reference to the extent of our knowledge concerning them, A. P. Kelley (*Landenberg, Pa.: Landenberg Lab., 1938, pp. 12*).—The author presents a synopsis of mycorrhizal angiosperms, gymnosperms, and pteridophytes, pointing out the limitations of our knowledge of mycorrhizas and indicating where it might be widened.

Respiration and lactic acid production by a fungus of the genus Rhizopus, S. A. Waksman and J. W. Foster (N. J. Expt. Stas.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 12, pp. 873–899, figs. 5*).—In general, conditions favoring growth of the *Rhizopus* used proved unfavorable to the accumulation of lactic acid. The fully grown pellicle in a sugar solution produced lactic acid up to 50 percent of the sugar under anaerobic and to ±60 percent under aerobic conditions, some growth accompanying the process in the latter case. Only ±30–40 percent of the carbohydrate consumed was changed to the acid in the absence of a neutralizing agent, in growth cultures, and as much as 70–75 percent in its presence. It is thus concluded that the fungus produces lactic acid by a fermentation mechanism despite its strictly aerobic nature. The acid is preceded by an intermedi-

ary substance, converted by the pellicles under anaerobic conditions to the extent of 50 percent to the acid and the remaining portion to alcohol and CO_2, with the liberation of only a little energy. During growth or under aerobic conditions the lactic acid and alcohol precursors are oxidized partly to the acid and partly to CO_2. The presence of different elements influences which reaction shall predominate, e. g., zinc favors growth and is unfavorable to lactic acid production, while the reverse influences are exerted by iron. *Rhizopus* is thus shown to possess both fermentative and oxidative mechanisms, resembling those of higher forms of life.

Element assimilation by plant life, with reference abstract bibliography: A contribution to the literature on agronomy, G. H. RIDDLE (*Res. Found., Inc., [1938], pp. [183], figs. 47*).—This monograph on the phenomenon of element assimilation by plant life—which the author concludes to be due to specific physical, chemical, and electrokinetic forces coordinating to either buffer or accelerate their several functions—is described by the author as "a technical paper designed to clarify the general conception as to the functions of any specific plant in employing selective (or elective) dialysis as regards the quantity of any element, or the ions of such element, which it utilizes from the soil solutions. Such quantity, under conditions normal to the healthy plant having been designated by the author as the 'Saturation Constant Specific to the Plant.'" The reference abstract bibliography contains a large number of references, and author and subject indexes are provided.

Effects of a limiting element on the absorption of individual elements and on the anion : cation balance in wheat, A. G. MCCALLA and E. K. WOODFORD (*Plant Physiol., 13 (1938), No. 4, pp. 695–712, figs. 5*).—Limiting the supply of one nutrient resulted in an increased uptake of another absorbed as an ion of the same sign, or in a decreased total uptake of the nutrients absorbed as ions of opposite sign. With N limiting, the effect was chiefly felt in increased P absorption, although there was also in some cases an increased S absorption. In one series of graded N and P supply, the increased P absorption resulting from limiting N supply was fully equivalent to the decreased N uptake. Limiting K was accompanied by increased absorption of both Ca and Mg. Limiting Ca was accompanied by relatively increased absorption of K and Mg and slightly decreased absorption of anions. In spite of relatively enormous differences in ratios of individual nutrients as a result of limiting one of them, there was a marked tendency toward maintaining a balance between total anions and cations—this balance always being in favor of the anions.

The effect of drops of water on leaf temperatures, P. J. KRAMER (*Amer. Jour. Bot., 26 (1939), No. 1, pp. 12–14, figs. 2*).—Temperatures of sprayed leaves of six different kinds of plants as measured by copper-constantan thermocouples inserted into the leaves, both under a 500-w. tungsten lamp and exposed to the sun, were 4°–12° C. less than corresponding unwet leaves. The focal point of drops of water on the leaf surface was found to be usually greater than the leaf thickness, rendering doubtful the commonly reputed injury to leaves from exposure to sun while water drops are present.

Stomatal index and transpiration rate of leaves, H. B. SMITH (*Science, 89 (1939), No. 2308, pp. 268, 269*).—The author presents observations on beans supporting the view that juvenile leaves may be advantageously used to compare plants in breeding work dealing with transpiration rate, and that transpiration rate is associated with stomatal index rather than with stomatal number. This index may be determined from any of the leaves of a young bean plant.

Quantitative isolation of chloroplasts from higher plants, S. GRANICK (*Amer. Jour. Bot., 25 (1938), No. 8, pp. 558–561*).—By this method, using tomato

and tobacco leaves, the cells were torn apart by grinding under hypertonic sugar solutions, and the chloroplasts were separated from the other cell materials by differential centrifuging. A method is also presented for relating the quantity of chloroplasts isolated to the total quantity in the leaf sample, based on the assumption that the number of chloroplasts is directly proportional to the quantity of contained pigments.

Chloroplast nitrogen of some higher plants, S. GRANICK (*Amer. Jour. Bot.*, *25* (*1938*), *No. 8*, *pp. 561–567*, *fig. 1*).—Methods are described for determining the nitrogenous constituents of the chloroplasts as compared to the remainder of the protoplasm during the development and aging of leaf parenchyma cells of tomato and tobacco, the chloroplasts being first removed as described in the preceding paper. The nitrogen fractions of the chloroplasts analyzed consisted of a crude-lipid fraction soluble in alcohol-ether, a protein fraction insoluble in 7 percent trichloracetic acid, and a soluble rest-nitrogen. The nitrogen of the chloroplasts increased with the nitrogen of the rest of the protoplasm, and in these two plants contained 30–40 percent of the total nitrogen of the leaf blade material outside the midrib and main veins. The protein of the chloroplast constituted 80 percent of the chloroplast nitrogen, and chlorophylls a+b accounted for another 10 percent. In the average leaf parenchyma cell it was estimated that 35–45 percent of its protein was contained in its chloroplasts. A parenchyma cell at two-thirds its maximum attainable size contained ±10 times more total nitrogen and protein nitrogen than a cell one-third its maximum size, while the nitrogen of the fully expanded cell was only 25 percent greater than that of the cell at two-thirds its maximum size. The evidence suggests that the chloroplasts as well as the nonchloroplast protoplasm have the ability to synthesize their own proteins. Assuming a molecular weight of 100,000 for the proteins of the chloroplast, it is estimated that there are ±30 chlorophyll molecules for each protein molecule of the chloroplast.

Influence of photoperiod and other factors on the formation of flower primordia in the potato, H. A. JONES and H. A. BORTHWICK. (U. S. D. A.). (*Amer. Potato Jour.*, *15* (*1938*), *No. 12*, *pp. 331–336*, *fig. 1*).—In potato the first inflorescence was differentiated at approximately the same node under a range of temperature, photoperiod, size of seed piece, etc. The small size of seed piece (5 gm.), the high temperature (day 80° and night 55° F.), and the short photoperiod (9 hr.) tended to increase the node number to the first inflorescence. Flower primordia were differentiated in darkness.

The time course of photosynthesis as shown by the glass electrode, with anomalies in the acidity changes, L. R. BLINKS and R. K. SKOW (*Natl. Acad. Sci. Proc.*, *24* (*1938*), *No. 10*, *pp. 413–419*, *figs. 4*).—The glass electrode method described is believed to have value in indicating the direction and the relative speed of photosynthesis during the first moments of illumination. It is further believed that the anomalies are not artifacts, since obvious controls with dead tissue, green cellophane, black paper, agar, or the blank electrode failed to show any significant response to light. Infrared was largely filtered out, and when used alone it gave only a slow drift due to heating, quite different from the cusps in visible light.

The time course of photosynthesis as shown by a rapid electrode method for oxygen, L. R. BLINKS and R. K. SKOW (*Natl. Acad. Sci. Proc.*, *24* (*1938*), *No. 10*, *pp. 420–427*, *figs. 5*).—Application of the glass electrode in direct contact with plant cells or tissues (see preceding entry) proved so valuable in following rapid CO_2 changes during and after illumination that a corresponding method for following oxygen evolution and consumption was worked out and is described and compared. It is believed that this method may give a valu-

able correction to apply in determining the true photosynthetic rate for quantum efficiency and other determinations.

Effect of ultraviolet radiation on plants, H. W. Popp (*Pennsylvania Sta. Bul. 367 (1938), pp. 32, 33, 34*).—Note on the effects of different wavelengths on growth substance and development of plants.

The Mirsky-Pauling theory of the structure of native, denatured, and coagulated proteins, and some theoretical aspects of the evolution of oxygen from the irradiated green plant, O. L. Inman (*Plant Physiol., 13 (1938), No. 4, pp. 859–862*).—This review and discussion calls attention to some possible relationships which may exist between the sensitization and denaturation of proteins and one phase of the mechanism of photosynthesis. Although there seems to be no good reason for assuming that visible radiation directly activates either CO_2 or water, it is deemed to be certainly possible that water or CO_2 or a combination of the two, when associated with chlorophyll which does absorb visible radiation, might become activated and enter into chemical and photochemical reactions one of which could be the release of oxygen.

The metabolism of proteins in green leaves, H. B. Vickery (*In Cold Spring Harbor Symposia on Quantitative Biology, VI. Cold Spring Harbor, N. Y.: Biol. Lab., 1938, vol. 6, pp. 67–78, figs. 6*).—This is a critical analytical review of the present status of knowledge (33 literature references), including the findings of the author and his associates.

Preliminary experiments on biotin, W. J. Robbins and M. B. Schmidt (*Bul. Torrey Bot. Club, 66 (1939), No. 3, pp. 139–150, fig. 1*).—Based on its effect on the growth of *Ashbya gossypii* (method described), the amount of biotin found in a sample of liquid manure was $150{,}000 \times 10^{-3}\gamma$ per gram of dry weight, while unfiltered sirup, cerophyl, and egg yolk contained ±600 units and other substances tested smaller quantities. The amount decreased with the purity of the sugar samples tested. Neither pantothenic acid nor vitamin B_6 were found to replace biotin.

The influence of certain growth-promoting substances on the rooting of some southern ornamental plants, E. W. McElwee. (Ala. Expt. Sta.). (*Assoc. South. Agr. Workers Proc., 39 (1938), pp. 110, 111*).—An abstract.

An assay method for growth-promoting substances utilizing straight growth of the Avena coleoptile, R. L. Weintraub (*Smithsn. Misc. Collect., 97 (1938), No. 11, pp. [1]+10, pl. 1, fig. 1*).—The assay method here described for growth-promoting substances, utilizing straight growth of the oat coleoptile, is believed to possess a number of theoretical and practical advantages over the widely used curvature test.

Carbohydrates of bean plants after treatment with indole-3-acetic acid, T. R. Alexander (*Plant Physiol., 13 (1938), No. 4, pp. 845–858, figs. 7*).—When the stem ends of beans were removed above the primary leaves and the stumps treated with 2 percent indole-3-acetic acid-lanolin, tumors and roots developed at the point of treatment, but the final dry weight was greater in the control than in the treated plants. Carbohydrates were translocated toward the point of treatment, but the final amount of starch was greater in the untreated controls. Indole-3-acetic acid stimulation induced conditions causing simple carbohydrates to be condensed to complex polysaccharides at the point of application. Losses in dry weight of the treated plants are said to indicate respiratory increases. Reduction of soluble carbohydrates in the treated stem ends was caused by increases in acid-hydrolyzable substances, and probably also by respiration incident to the stimulated metabolic activity of the tumor.

The dual effect of auxin on root formation, F. W. Went (*Amer. Jour. Bot., 26 (1939), No. 1, pp. 24–29, fig. 1*).—Using etiolated pea stem cuttings which

are relatively free from auxin, it was shown that phenyl acetic acid is not in itself a root-forming substance. Although redistribution of rhizocaline was tentatively considered the immediate effect of this material and several other substances, including indole acetic acid, it is suggested that the latter and related substances can induce root formation subsequently by activation of the accumulated rhizocaline.

After-effects of the treatment of seed with auxin, K. V. Thimann and R. H. Lane (*Amer. Jour. Bot., 25 (1938), No. 7, pp. 535–543, figs. 8*).—Using *Avena* and *Triticum*, low auxin (indole-3-acetic acid) concentrations accelerated the rate of root elongation while high concentrations inhibited it. However, if the auxin was removed the growth of the inhibited roots became faster than that of the controls, so that in a few days the treated roots were considerably longer. Furthermore, high auxin treatment increased the number of roots on the young plants. After such treatment with high auxin concentrations the general vegetative growth of the shoot is accelerated, the leaves may become longer and wider, and the dry weight of the plants may be increased more than 50 percent. Flowering is also slightly hastened. This general acceleration is considered an aftereffect, due to the action of auxin on the root system. If auxin treatment of *Avena* is delayed until the seedlings are 24 hr. or more old the length of the first leaf is decreased, while in *Triticum* this result follows both the delayed treatment and treatment of the seed. Growth of later leaves is nevertheless hastened. Vernalization brings about the same results in *Triticum*. It is therefore tentatively suggested that the vegetative effects of vernalization are due to the prolonged exposure of the seed to its internal auxin supply.

Nicotinic acid and the growth of isolated pea embryos, J. Bonner (*Plant Physiol., 13 (1938), No. 4, pp. 865–868*).—Evidence is presented that nicotinic acid, known to be a component of the vitamin B complex and to be indispensable to the growth of certain micro-organisms, is also a growth factor for pea seedlings. Its general distribution or that of closely related derivatives in natural plant products leads to the tentative conclusion that its function is also widespread in the higher plants.

Synthesis carried out in vivo by isolated pea roots, I, J. Bonner and E. R. Buchman (*Natl. Acad. Sci. Proc., 24 (1938), No. 10, pp. 431–438*).—Under closely controlled environment and nutrient supply it is shown that the isolated pea root synthesizes vitamin B_1 or something indistinguishable from it by *Phytophthora* assay from a mixture of the pyrimidine and thiazole components of the vitamin molecule, and that this reaction is carried out in vivo under conditions such that no in vitro reaction can occur. This must be a synthesis in which a specific enzyme takes part. A second and distinct enzyme system is able to effect closure of the thiazole ring from suitable acyclic substances to form the vitamin thiazole. It is suggested that both "thiaminase" and "thiazolase" play their parts in the natural synthesis of thiamin by the plant. It was further shown that certain thiazole derivatives are transformed to the vitamin thiazole in vivo by enzymatic reactions corresponding to deamination, decarboxylation, hydrolysis, and hydration, whereas certain other growth-promoting thiazoles are not so transformed. It is suggested that the methods outlined may offer a new and more exact approach to the problem of the mechanism of biosyntheses.

Thiamin (vitamin B_1) and the growth of roots: The relation of chemical structure to physiological activity, J. Bonner (*Amer. Jour. Bot., 25 (1938), No. 7, pp. 543–549, figs. 2*).—The root tips, as excised from seedling peas, are found to contain a considerable "reser[illegible]min does

not limit root growth in vitro until the roots have grown 60 mm. or more and tips of these roots have been transferred to fresh medium. The pea root utilized an equimolar solution of the pyrimidine and thiazole portions of the thiamin molecule, and it is deemed probable that these two portions are synthesized in vivo to the vitamin molecule itself. The pea root utilized a considerable number of substituted thiazole compounds. It was found essential, however, that a hydroxyl group (or one readily metabolizable to it) be present in the molecule if the substance is to possess growth-factor activity for roots. Quaternary salts, unless the substituent possessed the prerequisites of an active pyrimidine, could not be utilized. "As the pyrimidine constituent the root can utilize 2,5 dimethyl, 6 amino pyrimidines, substituted in the 5 methyl position by groups which will permit of the formation of quaternary salts. The 6 amino group cannot be replaced by a hydroxyl group."

A plant growth inhibitor, W. S. Stewart, W. Bergren, and C. E. Redemann (*Science, 89 (1939), No. 2304, pp. 185, 186, figs. 2*).—The ether extract of cotyledons of French Breakfast radish yielded by the simplified method of Van Overbeek (E. S. R., 79, p. 313) a substance producing on *Avena* effects opposite in character to those produced by indole-3-acetic acid.

Plant indicators—concept and status, A. W. Sampson. (Univ. Calif.). (*Bot. Rev., 5 (1939), No. 3, pp. 155–206, figs. 2*).—From this comprehensive review of a large literature (142 references) it is deemed evident that there are many kinds of plant indicators, and the consensus of opinion is that communities of plants are more reliable in indicating the character of the habitat than are individual species. Although experienced field workers often make use of plant indicators in various ways, there is as yet no recognized technic for selecting them. Applications to land-use problems, including forestry, and to grazing lands are discussed especially. It is concluded that a broader use of indicator communities and species is likely, but there must first be a more critical study of the growth requirements of both the indicator and the economic species before the method will reach its maximum reliance.

Notes on the genus Ribes in California, C. R. Quick. (U. S. D. A.). (*Madroño, 4 (1938), No. 8, pp. 286–290, pl. 1*).—In the course of field work in the control of white pine blister rust, field supervisors have made interesting observations on the distribution and morphology of native *Ribes* species. The notes here presented include the more important of those observations not hitherto recorded.

The anatomical development of Lepidium draba, A. O. Simonds. (Colo. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 12, pp. 917–928, pls. 4, figs. 5*).—This investigation of the anatomical development of hoary cress from seed to maturity deals with one of the most persistent perennial weeds in the West. It takes up the seedling morphology; the anatomy of the embryo; the root, including the structure of the xylem, phloem, and cortex; the root-stem transition; the stem, including the primary structures and changes in the mature stem; the crown; adventitious shoot and root formation; and the leaf. Details are presented and illustrated.

Influence of culture conditions upon the growth and development of Dictyostelium discoideum, K. B. Raper. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 3, pp. 157–198, figs. 10*).—Continuing the culture studies of this slime mold of the soil (E. S. R., 78, p. 202), a medium containing 1.2 percent each of peptone and a carbohydrate easily fermented by the associated bacteria was found to provide an especially favorable substrate for growing the host bacteria (*Escherichia coli* and *Pseudomonas fluorescens* used) and for the subsequent growth and normal development of the *Dictyostelium*. In the absence

of a fermentable carbohydrate the colonies of host bacteria became alkaline and toxic to the slime mold. The optimum reaction for the latter was pH 6–6.5, while good growth and normal fruiting structures occurred regularly on bacterial colonies at pH 5–7. The myxamoebae failed to feed effectively on bacterial cells encased in gum or slime, although such colonies were wholly nontoxic to the slime mold. More nearly optimum conditions were required for development of the fruiting structures than for vegetative growth, and in turn the requirements were stricter for normal than for abnormal sorocarp development. In fact, the sorocarp pattern served as a useful basis of judgment as to the favorableness of cultures to this organism. The bibliography contains 28 references.

Temperature effects upon the growth of excised root tips, G. C. GALLIGAR (*Plant Physiol., 13 (1938), No. 4, pp. 835–844, fig. 1*).—The optimum temperature for excised pea roots was found to be 10° C., for sunflower and corn 20°, and for cotton 25°. Few lateral roots or none developed at 10° and 35°. Anthocyanin formation in corn was inhibited at 25° and 35°, while 10° and 15° retarded pigmentation in cotton. Marked distention in diameter occurred in pea roots at 10° and 25°, and in corn and sunflower roots at 35°. For the growth of root tips of all four plants, 35° was definitely beyond the range of optimum temperature.

A method for the culture of excised plant parts, R. F. DAWSON (*Amer. Jour. Bot., 25 (1938), No. 7, pp. 522–524*).—By the method described, leafy shoots of tobacco were cultured in solutions containing organic substances, decomposition of which was practically prevented by chilling the cultures to 5°–10° C. Several external factors apparently influencing the success of cut stem and excised leaf cultures are discussed.

Pollen longevity of Ginkgo, E. H. NEWCOMER. (Mich. State Col.). (*Bul. Torrey Bot. Club, 66 (1939), No. 2, pp. 121–123, figs. 4*).—An experiment is reported in which the pollen maintained its viability for a period of nearly 16 mo.

GENETICS

Principles of genetics, E. W. SINNOTT and L. C. DUNN (*New York and London: McGraw-Hill Book Co., 1939, 3. ed., pp. XIV+408, [pl. 1], figs. 147*).—This revision (E. S. R., 54, p. 427) has been largely rewritten to incorporate the advances in the development of genetics which take account of progress in gene location by studies of large salivary chromosomes of some insects, induction of mutations by radiation, contributions of transplantation of tissues to physiological action of the gene, and other related developments.

What are the genes?—II, The physico-chemical picture: Conclusions, A. GULICK. (Univ. Mo.). (*Quart. Rev. Biol., 13 (1938), No. 2, pp. 140–168, figs. 7*).—Continuing these studies (E. S. R., 79, p. 610), genes are concluded to unite characteristics that render an organism capable of metabolism and amenable to the biological type of evolutionary processes. The number, size, and composition of genes suggest that they are essentially living units consisting either of a single large molecule or a cluster of molecules of nucleic acid and nitrogen-rich amino acids. Two types of action are attributed to genes. One is autocatalytic, permitting formation of further similar molecules, and the second is an enzymelike control over cytoplasmic happenings. Chemical alteration in the gene results in mutations. The haploid gene numbers were estimated as between 2,000 and 13,000 for *Drosophila* and 6,600 and 78,000 for man.

Spragg memorial lectures on plant breeding (*East Lansing: Mich. State Col., 1937, pp. 86; 1938, pp. 16*).—The lectures in this series include Contribution of Plant Breeding to the Agriculture of the United States, by H. H. Love

(pp. 5–16), and Heredity and Environment, by R. A. Emerson (pp. 33–41) (both Cornell Univ.); New Crops for Old, by T. A. Kiesselbach (pp. 17–32) (Univ. Nebr.); Disease Resistance in Crop Plants, by J. H. Parker (pp. 42–48) (Kans. State Col.); The Role of Plant Breeding in Crop Improvement, by H. K. Hayes (pp. 49–56) (Univ. Minn.); The Life and Work of Luther Burbank, by D. F. Jones (pp. 57–76) (Conn. [New Haven] Expt. Sta.); Improvement of Pasture Grasses and Legumes, by L. E. Kirk (pp. 77–86); and Corn Breeding Experience and Its Probable Eventual Effect on the Technique of Livestock Breeding, by H. A. Wallace (pp. 3–16) (U. S. D. A.).

Radiation and plant cytogenetics, T. H. GOODSPEED and F. M. UBER. (Univ. Calif. and Univ. Mo.) (*Bot. Rev., 5 (1939), No. 1, pp. 1–48*).—The subject is reviewed (326 references) under the headings: Introduction and historical summary, physical nature of biological effects of radiation (X-rays, alpha particles, neutrons, and electrons including cathode and beta rays), types of material irradiated, types of induced alteration, and cytogenetic consequences of chromosomal alterations.

Effect of the Dt gene on the mutability of the a_1 allele in maize, M. M. RHOADES. (U. S. D. A.). (*Genetics, 23 (1938), No. 4, pp. 377–397, figs. 5*).—Further studies (E. S. R., 77, p. 175) showed that the a_1 allel (dotted aleurone), which has a low spontaneous mutation rate in the presence of recessive *dt*, becomes highly mutable with dominant *Dt*, the mutation frequency being proportional to the dosage of the a_1 gene. Mutations of a_1 to the A_1 allel occur about 1,000 times as frequently as to the a_1^p allel. Mutations of a_1 occurred in aleurone, culm and sheaths, and pericarp, and there were indications that they occur late in the development of each tissue and not consonantly in all parts of the plant. The existence of a dominant modifying gene which decreases mutation frequency was indicated. The a_1 and *Dt* genes are not linked; a_1 is in chromosome 3, and *Dt* may be in chromosome 9. The data did not support the view that mutations of a_1 induced by *Dt* result from a position effect; *Dt* remains unaltered when a mutation of a_1 takes place. Cytological observations of the *Dt* and *dt* stocks showed no evidence of gross chromosomal aberrations.

Induction of polyploidy in Nicotiana by hetero-auxin treatment, W. H. GREENLEAF. (Univ. Calif.). (*Jour. Heredity, 29 (1938), No. 12, pp. 451–464, figs. 8*).—Using indole-3-acetic acid, plants of several species and species hybrids of *Nicotiana* were made to regenerate plentifully. Two F_1 hybrids in particular were employed in the tests reported, viz, *N. sylvestris-tomentosiformis* and *N. sylvestris-tomentosa*. Enormous calluses were in many cases formed and hundreds of shoots were obtained from them. These plants failed to regenerate without heteroauxin. Treatment resulting in shoot formation in *Nicotiana* inhibited such results on callus of tomato plants. In 1,973 classified shoots of the two hybrids above named the frequency of tetraploid shoots was 13.7 percent. Also ±30 octoploid and 5 different heteroploid shoots occurred. The allo-octoploid types with 96 chromosomes showed great deviation in morphology as compared with corresponding diploids and tetraploids. A general decrease in plant size was correlated with general monstrosity in the 8*n* plants. The changes went beyond the usual quantitative deviations from parental form observed in polyploids in general. The theoretical behavior of tetraploids on inbreeding is considered on the basis of random chromosome and chromatid segregation in the simplex, duplex, and triplex, and the expected proportions of homozygosis are calculated up to five generations.

Somatic variation of chromosome numbers in hybrid wheats, R. M. LOVE (*Genetics, 23 (1938), No. 6, pp. 517–522, pl. 1*).—Pollen mother cells with aberrant chromosome numbers ranging from 15 to 61 and bivalent chromosomes

varying from 3 to 29 were found in 16 of 336 plants of 50 *vulgare*-like lines derived from interspecific crosses involving 4 varieties of *Triticum vulgare* and Iumillo (*T. durum*).

Cytology of poplar species and natural hybrids, F. H. PETO (*Canad. Jour. Res., 16 (1938), No. 11, Sect. C, pp. 445–455, pl. 1, figs. 6*).—Of five species and two species hybrids examined at the first metaphase of pollen mother cell formation, *Populus alba* and two of four *P. canescens* trees were found to be triploid, while all others were diploid. Pollen characters, such as percentage of good pollen, pollen diameter, and pollen-size distribution, were generally not indicative of chromosome number or pairing relations at first metaphase. The tendency for the poplars to produce unreduced pollen grains is believed to explain the number of triploid trees discovered in Canada and Sweden.

Intergeneric hybridization.—A preliminary note of investigations on the use of colchicine in inducing fertility, A. R. RAW (*Jour. Dept. Agr. Victoria, 37 (1939), No. 1, pp. 50–52, figs. 3*).—The successful induction of complete fertility in the normally totally sterile intergeneric hybrid *Triticum vulgare* × *Agropyron intermedium* by the action of colchicine is reported.

The breeding of new yeast types through hybridization, O. WINGE (*Bakers Tech. Digest, 13 (1939), No. 7, pp. 123–125, figs. 9*).—A popular discussion of progress in this field.

The nature and origin of filtrable viruses, C. C. LINDEGREN (*Jour. Heredity, 29 (1938), No. 11, pp. 409–414*).—This theoretical consideration relates the bacteriophage and other filtrable viruses to the gene, and postulates that the cooperation of genes and cytoplasm may depend on two restrictive devices, viz, the chromatin envelope of the gene which prevents contact of gene and cytoplasm at mitosis and the nuclear membrane which prevents contact of the more or less exposed resting-stage genes and the cytoplasm. Free genes and cytoplasm may be antagonistic because the cytoplasm may contain gene-inactivating antibodies, and genes in direct contact with cytoplasm (if not inactivated by antibodies) might divide without restraint and destroy the cytoplasm together with the food stored in it. It is assumed that the interposed chromosomal and nuclear membrane in ordinary living forms make it possible for the genes to transform and direct the energy supplied by the cytoplasm.

[Research in animal genetics and breeding at the Iowa Station], J. L. LUSH, C. Y. CANNON, E. N. HANSEN, P. S. SHEARER, C. C. CULBERTSON, M. D. HELSER, F. J. BEARD, B. H. THOMAS, N. F. WATERS, J. W. GOWEN, and E. W. LINDSTROM (*Iowa Sta. Rpt. 1938, pt. 1, pp. 79–84, 96, 153, 154*).—Studies of the consequences of inbreeding in Holstein-Friesian cattle and Poland China hogs; the amount of inbreeding in the Poland China breed; the milk records in cow-testing associations as to persistency and inheritance of milk and fat production; the value of the Danish Landrace in the development of improved strains of swine for American conditions; the effect of inbreeding and cross-breeding in the domestic fowl; and genes and viruses as to their structure and general organization of the inheritance are briefly noted.

[Experiments in animal genetics by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1938, pp. 90, 91, 145–147, 149*).—Brief results are given on the progress of studies of the effect of Progynon-B in combating failure of pregnancy in 7 of 10 cows treated, by S. A. Asdell, S. E. Smith, and M. G. Fincher; inheritance of differences between lines in interior egg quality, by G. O. Hall; the transmission of disease resistance and susceptibility to high temperatures in White Leghorns, Rhode Island Reds, and crosses between them, by F. B. Hutt and J. H. Bruckner; the relation of follicular hormone in the yolk of developing eggs to blood calcium, by W. F. Lamoreux and Hutt; and studies

of the genetics of curled toes, congenital blindness, nakedness, early maturity, and talpid lethal in poultry, by Hutt and Bruckner.

[Physiological and genetic studies with cattle] (*Wisconsin Sta. Bul. 442 (1938), pp. 55–57*).—Ovulation and heat were induced in "shy breeding" cows by L. E. Casida by the administration of gonadotropic hormones from the pituitary or oestrogen. The sex ratio of 1,044 fetuses varied with their age, larger percentages of males being found by A. B. Chapman, Casida, and A. Coté in the younger fetuses.

The breeding efficiency of proved (aged) sires, J. R. Dawson. (U. S. D. A.). (*Jour. Dairy Sci., 21 (1938), No. 11, pp. 725–737, fig. 1*).—A detailed analysis of the breeding efficiency after 5 yr. of age of 20 proved sires used at 8 branch stations of the U. S. D. A. Bureau of Dairy Industry is reported. The percentages of services to fertile cows that resulted in conceptions were tabulated with reference to age, frequency of service, season, and effect of the distance that the bulls were moved by the stations. So much variation was exhibited by the individual sires that the averages seemed to be of little value for prediction of the effect of different methods of handling on individual sires.

The influence of skeletal alterations on the milch qualities of the Sahiwal breed, W. Sayer (*Agr. and Livestock in India, 8 (1938), No. 5, pp. 541–546, pls. 5*).—Progress in breeding away from loose sheaths and skin and pendulous udders in Sahiwal bulls and cows without losing the potentialities for milk production is reported.

[Inheritance studies with sheep and goats by the Texas Station], J. M. Jones, B. L. Warwick, W. H. Dameron, S. P. Davis, H. C. McPhee, and D. A. Spencer. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1937, pp. 41, 42–44*).—Brief reports are given which indicate some dominance of the genes for freedom from skin folds in Rambouillets, although only a small number of individuals have been produced. Studies with Angora goats indicate that type of lock, i. e., flat lock or ringlet, has little effect on the quality or quantity of scoured mohair. Shrinkage of mohair was generally less than that of Rambouillet wool produced under the same conditions. Data are also given on an attempt to cross a Barbary ram with sheep and goats which indicated that this species is in a different genus from either.

[Genetic studies with poultry by the Oklahoma Station], R. G. Jaap (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. 160–163, 175–177*).—Brief reports are given on the production of a true-breeding strain of fowls which permits separation of the sexes at hatching, the possibilities of the elimination of barebacks, the mode of inheritance of baldness in several breeds (E. S. R., 79, p. 319), and rapid feathering in Plymouth Rocks. In a study of the inheritance of body size and shape in turkeys, certain differences in shank length and measurements were noted between the sexes which may be measured by shape ratios at between 20 and 28 weeks of age.

On the validity of progeny tests of sires obtained on culled populations of daughters, S. Bird and J. W. Sinclair (*Sci. Agr., 19 (1938), No. 1. pp. 1–6, figs. 2*).—To study the effects of culling on progeny tests in poultry flocks, different percentages of the lowest producers were culled from three populations. The accuracy of calculating the entire population from the truncated portion of the distribution depends on the amount of culling and how close the population approached a normal distribution. Culling should be kept between 15 and 25 percent; and only 75 percent of the culling should be done during the laying season, with 25 percent "paper culling" after completion of the test. Culling for other conditions than production should not be done while

the test is in progress. Truncated distributions after such selection are thought to be better for progeny testing than undisturbed populations.

Crossbreeding poultry for meat production, including a feeding test of taro waste and poi, C. M. Bice and B. A. Tower. (Coop. U. S. D. A.). (*Hawaii Sta. Bul. 81 (1939), pp. [2]+19, figs. 4*).—Comparative studies of the hybrids produced from crosses of Japanese Shamo Game ♂♂ with Barred Plymouth Rock, Rhode Island Red, and Single Comb White Leghorn ♀♀ showed that, in general, the hybrids were superior in rate and economy of gains to purebreds except for the Shamo Games. The dressed carcasses of the hybrids were superior in appearance to those of the purebreds, and the hybrid carcasses in the Shamo Game × Leghorn cross lacked dark pinfeathers. The hatchability of the hybrids was definitely higher except for the Rhode Island Reds. The only sex-linked character exhibited in the day-old chicks was in the Plymouth Rock cross and involved black feathers with white spots on the heads of the ♂♂ while the ♀♀ are entirely black. All hybrid progeny were pea-combed.

In feeding experiments, taro waste proved an economical feed for fattening broilers, whereas the gains produced with poi were more costly than the standard ration.

Dual purpose poultry: Is breeding for meat type incompatible with breeding for egg type? E. A. Lloyd (*U. S. Egg and Poultry Mag., 45 (1939), No. 1, pp. 28–33, 52–54, figs. 18*).—Progress in the improvement of production and quality of eggs, meat grade, and resistance to fowl paralysis by selective breeding over a period of 20 yr. in White Leghorns, Barred Plymouth Rocks, and Rhode Island Reds at the University of British Columbia is reviewed.

Rôle of inherited natural resistance to tuberculosis, M. B. Lurie (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 1, pp. 176–181, figs. 3*).—Marked differences were noted between inbred families of rabbits in the way tuberculosis developed following natural infection. The three families also differed in the duration of the period of survival to artificial infection.

Nature of inherited natural resistance to tuberculosis, M. B. Lurie (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 1, pp. 181–187, figs. 5*).—Families of rabbits exhibiting varying degrees to resistnace to tuberculosis differed markedly in several factors, such as permeability of the skin, inflammatory response to tubercle bacilli and tuberculin, and the growth of lesions, which seemed to be jointly related to resistance.

Bent-nose in the Norway rat: A study of interaction of genes and diet in the development of the character, W. E. Heston. (Mich. State Col.). (*Jour. Heredity, 29 (1938), No. 11, pp. 437–448, figs. 2*).—The appearance of a bent-nose condition in rats which was related to the nutrition of the animals was found to involve an abnormal curvature of the rostrum of the nose which manifested itself between 34 and 120 days of age. As diet seemed related to the appearance of the anomaly, progeny of bent-nosed parents and two other control strains were raised on seven diets of varying calcium and phosphorus levels. The frequency of the bent-nosed individuals among the progeny of bent-nosed parents varied from less than 1 percent on a well-balanced stock ration to 64.91 percent on a low calcium ration. The results from one control stock roughly paralleled results from progeny of bent-nosed parents, but almost no bent-nosed animals were produced in the other control stock. Analysis of the results indicated that the calcium: phosphorus ratio was the deciding factor in the occurrence of the condition in strains with bent-nose genes. Supplements of vitamin D reduced the deleterious effects of the calcium-phosphorus imbalance. In general, growth rate was reduced in animals on rations which produced a high percentage of bent-nosed rats, but no causal connection was found between weights at birth

or weaning and the occurrence of the anomaly. Recessive genetic factors were shown to cause variations in the appearance of the bent-nosed progeny from the different matings on the same diets. More than one pair of genes seemed responsible for the condition.

Genetical studies on immunity in mice.—II, Correlation between antibody formation and resistance, P. A. Gorer and H. Schütze (*Jour. Hyg. [London], 38 (1938), No. 6, pp. 647–662*).—Continuing these studies,[1] four strains of mice were tested for the relation between resistance and the production of antibodies to *Salmonella typhi murium* and *S. enteritidis*. The greater production of both H and O agglutinins by ♀ ♀ than ♂ ♂ was correlated with resistance. Differences between lines were also noted. However, no positive correlation between agglutinins and resistance was noted after immunizing with *S. enteritidis*. Inbred strains reacted more uniformly than strains selected for resistance but not intensively inbred.

Incomplete development of the diaphragm in mice causing death from asphyxia, B. L. Evan Wang (*Anat. Rec., 71 (1938), No. 4, pp. 469–475, figs. 3*).—The occurrence of more or less related mice exhibiting abnormalities of the diaphragm, such as to cause air to pass and be held in the abdominal cavity, evidently interfering with breathing and causing asphyxiation is described from the Peiping Union Medical College.

Terminology of sex hormones, A. S. Parkes (*Nature [London], 141 (1938), No. 3557, p. 36*).—The author suggests the term "gynaecogenic" as more descriptive of the oestrogenic hormones to take care of their noncyclic as well as cyclic effects. "Ambisexual" might be applied to extracts exhibiting activities pertaining to both sexes. Likewise, the use of the suffix "trophic" instead of "tropic" in such words as "gonadotropic" seems logical.

Nomenclature of gonad-stimulating hormones of placental origin, E. B. Astwood and R. O. Greep (*Science, 89 (1939), No. 2300, p. 81*).—It is proposed that the term "cyonin" be applied to the hormones of chorionic origin and protein nature which act to sustain a ♀ sex hormone balance favorable to pregnancy. Thus "human cyonin" would replace "pregnancy urine," "pregnancy prolan," "anterior-pituitary-like hormone," and similar terms.

Hormone studies with the ultra-centrifuge.—II, The concentration of anterior lobe and pituitary-like hormones with the ultra-centrifuge, A. E. Severinghaus, L. Levin, and J. A. Chiles, Jr. (*Endocrinology, 23 (1938), No. 3, pp. 285–291, fig. 1*).—By the use of the ultracentrifuge,[2] marked concentration of the gonadotropic potency of mare serum and castrate urine preparations was effected. The treatment did not concentrate the thyrotropic hormone.

The nipple test: Studies in the local and systemic effects on topical application of various sex-hormones, W. Jadassohn, E. Uehlinger, and A. Margot (*Jour. Invest. Dermatol., 1 (1938), No. 1, pp. 31–43, fig. 1*).—The application of several androgens and andrenosterone and corticosterone in aqueous solutions caused significant enlargement in the nipples of ♂ guinea pigs, but oily solutions were without effect. However, oestrogens in aqueous solutions were much more effective than the androgens. Anol, a nonsterol, also proved active in the nipple test.

The effect of testosterone propionate on the genital tract of the immature female rat, U. J. Salmon (*Endocrinology, 23 (1938), No. 6, pp. 779–783, figs. 11*).—The administration of testosterone propionate caused premature opening of the vagina, follicle growth, corpora lutea formation, oestrous

[1] Jour. Hyg. [London], 36 (1936), No. 1, pp. 37–49, figs. 10.
[2] Jour. Expt. Med., 68 (1938), No. 1, pp. 1–16, figs. 7.

reaction in the smear, and marked enlargement of the preputial glands, of immature ♀ rats. In ovariectomized ♀♀ testosterone caused less marked enlargement of the uterus and opening of the vagina than in intact ♀♀. Testosterone propionate is thought to act directly on the ♀ genital tract, and indirectly on the tract in conjunction with progesterone from the corpus luteum.

Gonadotropic action of testosterone propionate on the immature mouse ovary, W. F. Starkey and J. H. Leathem (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 1, pp. 218–220, figs. 4*).—Single injections of testosterone propionate into 18- to 21-day-old mice caused follicle stimulation and hypertrophy of the uterus in from 48 to 72 hr. Lutein tissue was not observed. Doses of 1 and 2 mg. gave similar responses, but response was less in animals treated with 0.5 mg.

Influence of testosterone propionate on vaginal opening in the immature albino rat, H. S. Rubinstein, A. R. Abarbanel, and D. N. Nader (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 1, pp. 20–22*).—Since the administration of testosterone propionate to spayed and nonspayed 26-day-old rats caused vaginal opening at an average of from 33 to 34 days, it is concluded that this action was directly on the vaginal zone and independent of the ovary. Vaginal opening in normal controls occurred at from 40 to 48 days of age, and later, if at all, in spayed ♀♀.

Effect of estrogen injections on lactogen content of female rat pituitary, R. P. Reece. (N. J. Expt. Stas.). (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 1, pp. 77–80*).—Following up earlier studies (E. S. R., 78, p. 324), which showed that oestrogen injections increased the lactogen content of the pituitary glands of ovariectomized rats, normal ♀♀ were injected with doses of from 200 to 1,000 International Units of Progynon-B per day for 15 days. The pituitaries of the treated rats were almost double the size of those from untreated rats, and the total pigeon crop-gland units of lactogen per pituitary gland were increased about 40 percent with the smaller dose of oestrogen and 28 percent with the larger dose. The pituitaries from ovariectomized rats injected with 1,000 I. U. were significantly larger than from rats with ovaries intact and similarly treated.

The influence of a normal ovary on the formation of typical irradiation tissues in the X-rayed ovary, I. G. Schmidt (*Anat. Rec., 71 (1938), No. 4, pp. 409–412*).—Twelve virgin ♀ guinea pigs were irradiated so that one ovary was protected. The untreated ovaries were normal and did not hypertrophy, although the irradiated ovaries became small and atrophic, and glandular tissue did not form in them. Oestrous cycles and the vaginal opening were, in general, normal. The pituitaries of treated rats were slightly larger than the pituitaries of normal ♀♀.

The influence of urine of the pregnant cattle on the mammary gland of rabbit [trans. title], N. Kawano and S. Nakano (*Bul. Miyazaki Col. Agr. and Forestry, No. 10 (1938), pp. 1–21, figs. 15; Eng. abs., p. 15*).—Subcutaneous injection of urine from pregnant cattle into virgin, adult female nonpregnant and gonadectomized rabbits caused the animals to lactate within from 7 to 13 days. The milk produced was colostrumlike at first and later appeared normal. The stimulated mammary glands were not developed to the same degree and contained more connective tissue than is normally present. The follicular hormone (oestrin) and the trophoblast hormone (gonadotropin), both of which are produced by the placenta, were considered responsible for the mammary gland development.

Comparison of pregnancy urine injection and coitus as stimuli for ovulation in the rabbit, B. B. Rubenstein (*Soc. Expt. Biol. and Med. Proc.,*

39 (1938), No. 1, pp. 191–194).—Determination of the oxygen consumption and carbon dioxide production of tissues isolated from rabbits showed that during the 7- to 12-hr. interval after injection with pregnancy urine the oxygen consumption by the anterior pituitary per gram was practically trebled. A similar increase was noted in the oxygen consumption of adrenal tissue from 13 to 18 hr. after the administration of the pregnancy urine. No comparable increases in the metabolic rate of these glands were noted after coitus.

Effect of choline chloride on estrous cycle of mice, J. H. Mowat and and C. C. Little (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 1, pp. 211, 212*).—Choline chloride in doses as high as 6 mg. per day did not affect the recurrence of oestrous cycles in mice.

Growth of follicles in the ovaries of the bat Myotis lucifugus lucifugus, M. J. Guthrie and K. R. Jeffers. (Univ. Mo.). (*Anat. Rec., 71 (1938), No. 4, pp. 477–496, figs. 5*).—The ovaries of 40 ♀ bats, collected at intervals from late October until late in April, showed there were from 53 to 305 growing follicles present in them, which were equally distributed between the ovaries. Periodic seasonal variations suggested 3 peaks of growth for follicles 24μ to 43μ in diameter, which were followed by peaks of growth in the larger follicles. Hibernation is preceded by a fourth peak of growth. The size of the degenerating follicles varied with the season after February 6, degenerating follicles being smaller in size than earlier in the year.

Some observations on the semen production of the male fowl, W. H. Burrows and H. W. Titus. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 1, pp. 8–10*).—Studies of the semen production by 22 crossbred cockerels and 10 crossbred cocks about 1.5 yr. of age showed that the average yield per collection was about 19 percent greater if collections were made on alternate days as contrasted with daily collections. Full semen production of about 1 cc. per collection was reached at about 275 days of age and maintained throughout the experiment (579 days of age) except during February. On analysis after post mortem, approximately 61 percent of the variation in semen production of the individuals was related to testis size. Size of the comb and wattles and other characters including libido were not correlated with semen production.

The effect of testis hormone on the preservation of sperm life in the vas deferens of the fowl, S. S. Munro (*Jour. Expt. Biol., 15 (1938), No. 2, pp. 186–196, fig. 1*).—In a study with mature young cockerels the length of sperm life in the vas deferens under conditions of vas isolation (ligature of the vas deferens at both proximal and distal ends) without castration and accompanied by castration were compared. The mature sperms in the isolated ductus deferens retained the capacity for movement in physiological saline for an average of from 26 to 28 days in each instance, thus indicating that the testis hormone is not directly concerned with the maintenance of sperm life in the excurrent reproductive ducts of the fowl.

Functional changes in fowl sperm during their passage through the excurrent ducts of the male, S. S. Munro (*Jour. Expt. Zool., 79 (1938), No. 1, pp. 71–92*).—Further investigations were conducted to determine what changes, if any, occur in the capacity for movement and in the fertilizing capacity of formed sperms of fowls during their journey through the seminiferous tubules, the epididymis, and the ductus deferens. Sperms removed from the reproductive tract of recently killed mature cockerels and examined while suspended in physiological salt solution indicated that sperm motility is very slight in the testis, definitely increases in the epididymis, but reaches a maximum when in the vas deferens. When hens were artificially inseminated with sperms obtained from the various regions of the tract, fertility resulted in a very small

percentage of cases, with sperms from the testis, somewhat more frequently with those from the epididymis, and in a high percentage of cases with those from the vas deferens. The sperms traveled very quickly through the reproductive tract, passage occurring in 24 hr. in sexually active males but requiring from 72 to 96 hr. in nonactive males. It was evident that a male environment was necessary for the maturation or attainment of functional maturity of the fowl sperm.

On the exchange of bull semen between England and Holland, J. EDWARDS, A. WALTON, and J. SIEBENGA (*Jour. Agr. Sci.* [*England*], *28* (*1938*), *No. 3, pp. 503–508*).—Semen samples collected from an excellent-breeding bull in England were employed for the insemination of 26 difficult-breeding cows in the Netherlands. The semen samples were from 28 to 57 hr. old. Only 8 cows conceived. No pregnancies fo' owed the use of nonmotile semen. One of 3 cows inseminated in England with semen 28 hr. after collection in the Netherlands calved normally. No conceptions resulted from five inseminations with 72- and 48-hr. semen samples in poor condition. The service record of the Dutch bull was below normal.

Artificial insemination in dairy cattle, C. L. COLE and L. M. WINTERS. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 22* (*1939*), *No. 2, pp. 107–110*).—Methods of semen collection and artificial insemination of 121 cows in the vicinity of the North Central Substation at Grand Rapids, Minn., are described. Considering all of the cows, 1.77 inseminations were required per conception.

FIELD CROPS

[Agronomic research in Alabama, 1937], J. T. WILLIAMSON, J. W. RICHARDSON, R. W. TAYLOR, H. B. TISDALE, J. B. DICK, E. L. MAYTON, D. G. STURKIE, E. V. SMITH, and J. F. DUGGAR (*Alabama Sta. Rpt. 1937, pp. 9–12, 25, 26, 30, 31*).—Progress results are reported from experiments (E. S. R., 78, p. 774) concerned with effects on stands of 6–8–4 fertilizer at different rates, ammonium sulfate v. sodium nitrate on limed and unlimed soil, varieties and fertilizers in relation to wilt disease, merits of varieties, and effects of environmental factors on oil content of seed, all with cotton; manure, sodium nitrate, and vetch as nitrogen carriers for cotton and corn in rotation; effect of time of planting on stands of Dallis grass; germination studies in dry soil, and hot water treatment v. scarification, both with seed of *Crotalaria spectabilis;* frequency of cutting *Lespedeza sericea;* seasonal activity of bulbs of wild garlic as related to its control by creosote-kerosene or other sprays; and the life history of nutgrass as related to possible control methods.

[Farm crops research in Iowa], C. P. WILSIE, H. D. HUGHES, L. C. BURNETT, J. B. WENTZ, C. Y. CANNON, M. G. WEISS, E. V. COLLINS, J. N. MARTIN, W. H. PIERRE, P. M. NELSON, B. LOWE, J. L. ROBINSON, L. W. FORMAN, A. G. NORMAN, I. E. MELHUS, C. S. REDDY, W. F. BUCHHOLTZ, C. M. NAGEL, A. L. BAKKE, R. H. PORTER, J. M. AIKMAN, M. DONNELLY, A. T. ERWIN, N. D. MORGAN, J. B. DAVIDSON, C. K. SHEDD, A. A. BRYAN, R. M. HIXON, W. G. GAESSLER, E. L. ERICKSON, R. C. ECKHARDT, R. W. JUGENHEIMER, J. C. ELDREDGE, and E. W. LINDSTROM. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1938, pts. 1, pp. 53–63, 65–69, 115, 116, 118, 120, 121, 178, 179–181, 182, 184–186, figs. 4; 2, pp. 20, 21, 23–28, 29–33, 33–41, 41–45, figs. 3*).—In part 1, further reports of progress (E. S. R., 79, p. 470) are made on breeding work with oats, barley, wheat, soybeans, sweetclover, bromegrass, timothy, potatoes, and sweetpotatoes; variety tests with oats, wheat (coop. Minn. Expt. Sta.), barley, red clover, sweetclover, soybeans, edible soybeans, potatoes, and sweetpotatoes; adaptation studies with Mukden and Kanro soybeans and Korean lespedeza; seed treatments with seed flax varieties;

cultural studies with reed canary grass and with alfalfa varieties and alfalfa-timothy mixtures on bacterial wilt-infected soil; trials of legumes for green manure for corn and oats; relative value of red clover, alfalfa, and sweetclover as soil-building crops; studies of the adaptability of grasses and legumes to establishment and growth on subsoil v. fertile top soil; fertilizer and varietal factors affecting storage quality of sweetpotatoes; studies of sugar production and storage in sugar beets; fertilizer and propagation tests with sweetpotatoes; permanent pasture improvement; effects of fertilizers and grazing methods on soil conditions and plant growth on permanent pastures; properties and herbicidal action of sodium chlorate mixtures; and studies of the permeability of weed seed, particularly bindweed, to water.

Corn research proceeding as projects under the Iowa Corn Research Institute, covered in part 2, dealt with genetic relations of inbred lines, including influence of intensity of inbreeding on development of inbred lines, second cycle inbred lines, growth curves of inbred and hybrid corn, and maternal influence on tillering in corn; developing inbred lines of corn resistant to stalk and ear rots; genetic studies; improving inbred lines by crossing followed by selfing and sibbing; improvement through the use of inbred lines; growth response of hybrids and varieties on soils of different levels of fertility and on various soil types; tests of varieties, strains, and hybrid combinations in different parts of Iowa; hill spacing of check planted corn; comparison of single-plant hill spacings; corn production methods and equipment; correlation between composition and strength of stalk; maintenance of pure seed sources of improved varieties through field inspection and certification; production and distribution of seed of corn hybrids and of their parents; and breeding and varietal studies with popcorn. Other activities related to corn production were concerned with seed increase of new or improved varieties of field crops; technics used in seed analysis; and physiology of field bindweed (*Convolvulus arvensis*).

[Field crops work in Maine], R. M. BAILEY, D. S. FINK, F. CHADWICK, JR., J. A. CHUCKA, A. HAWKINS, and B. E. BROWN. (Partly coop. U. S. D. A.). (*Maine Sta. Bul. 391 (1938) pp. 261, 267–277, 284–286, 287*).—Fertilizer tests with potatoes involving rates of application with the usual and several spacings, different formulas, variations in potassium and magnesium contents, acid v. neutral fertilizers, limed v. unlimed soil, sources of phosphorus and potassium, and uncommon elements; variety tests with corn, alfalfa, and potatoes; and pasture improvement by fertilization and other practices are again (E. S. R., 79, p. 41) reported on.

[Field crops and plant improvement research in New York], J. A. BIZZELL, E. W. LELAND, J. K. WILSON, L. F. and F. RANDOLPH, S. RAVAGE, J. EINSET, D. B. HAND, R. A. EMERSON, A. C. FRASER, H. H. LOVE, E. DORSEY, F. P. BUSSELL, W. T. CRAIG, R. G. WIGGANS, J. R. LIVERMORE, A. G. NEWHALL, W. C. MUENSCHER, and O. SMITH. (Partly coop. U. S. D. A.). (*[New York] Cornell Sta. Rpt. 1938, pp. 82, 83, 101, 102, 125, 126, 127, 128, 131, 160, 162*).—Progress results are reported briefly from breeding work and genetic studies with corn, wheat, rye, oats, and barley; breeding experiments with soybeans and potatoes; studies on the number, form, and behavior of the chromosomes in corn and other plants, with special reference to their rôle in heredity, and on tetraploid corn, and the production of tetraploid strains of teosinte, Sudan grass, barley, iris, and other plants; experiments on the protein content of timothy and of alfalfa cut at several progressive stages of growth, nitrogen fertilization for timothy, and the production of silage from crops high in protein; handling and storage of seed potatoes; factors affecting chemical composition and culinary quality of potatoes; and control of weeds in onions by the use of herbicides.

[Agronomic work in North Dakota] (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 3, pp. 4, 5, 9–12, 17–19, 25–28, 31–39, figs. 3*).—Recent progress in experiments with field crops and in related activities is reviewed in brief articles entitled The Identification Service for Weeds and Other Plants, by O. A. Stevens (pp. 4, 5); Perennial Peppergrass in North Dakota, by E. A. Helgeson (pp. 9–12); Seed Flax Production and Flax Research, by T. H. Hopper (pp. 17–19); Does Wheat "Run Out"? by L. R. Waldron (pp. 25–28); Which Rust Resistant Wheats Are Most Desirable? by T. E. Stoa and R. H. Harris (pp. 31–35); New Varieties of Rust Resistant Wheat, by L. R. Waldron and R. H. Harris (pp. 35–37); and Breeding Potatoes for North Dakota, by H. Mattson (pp. 37–39).

[Field crops research in Oklahoma, 1936–38], J. E. Webster, H. B. Cordner, F. A. Romshe, H. J. Harper, H. F. Murphy, H. Dunlavy, L. L. Ligon, H. W. Staten, C. B. Cross, W. B. Gernert, and J. C. Ireland. (Partly coop. U. S. D. A.). (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. 5, 103–105, 112–115, 184–188, 189–215, figs. 10*).—Field crops work (E. S. R., 77, p. 38), reported on briefly for the above period, included variety tests with cotton, corn (hybrids), wheat, seed flax, potatoes, sweetpotatoes, and miscellaneous grasses and legumes; breeding work with cotton, corn, and grain sorghum; influence of wide v. narrow small grain rows on stands of lespedeza and sweetclover; investigation of floral structures and seed production in alfalfa; cultural (including planting) experiments with cotton, oats, and grasses; fruiting studies with cotton varieties; crimson clover for forage and soil improvement; merits of limestone in a wheat-sweetclover rotation; effects of time of applying nitrogen fertilizer on protein content of wheat; effect of seed treatments and soil conditions, especially temperature, on yields of fall-crop potatoes; storage experiments with spring-grown potatoes; curing studies with sweetpotatoes; feeding castor bean leaves to grasshoppers; and chemical studies on weed root reserves in relation to control.

[Special agronomic investigations in Oregon]. (Coop. U. S. D. A. et al.). (*Oregon Sta. Circ. 130 (1938), pp. 12–14, 16, 17, 36–38, 40, 41, figs. 24*).—Progress results, reported from agronomic experiments authorized by the 1937 legislature, included the establishment of good sod-forming grasses on logged-off land where a reasonably good burn of slashings had been made; new crops indicated for Malheur County, including Virginia and Illini soybeans for green manure or forage and Cayuga and Minsoy for seed, Newland and Rio flax, Minnesota 1085–4 wheat, hybrid seed corn, Trebi barley, White Rose potatoes, strawberry clover, and Orestan alfalfa; fertilizer tests in Malheur County showing favorable yield responses of potatoes, sugar beets, alfalfa, and other crops to treble superphosphate, of potatoes but not alfalfa to sulfur, and of several crops to complete fertilizer; weed control investigations, including chemicals, e. g., a sodium chlorate-oil emulsion making 100 percent kill of Canada thistle, control of annual weeds in grain by a 1.5-percent solution of Sinox and a 5-percent solution of sulfuric acid, control of lawn weeds by Sinox, copper nitrate, and kerosene and other chemicals, control of poison-oak by 1:60 solution of sodium arsenite or borax, and control of Canada thistle and morning-glory by cultivation; and certification and regulatory activities of the seed testing service.

[Field crops research in Pennsylvania], D. E. Haley, O. Olson, C. F. Noll, C. J. Irvin, H. B. Musser, J. W. White, J. S. Cobb, J. J. Reid, E. L. Nixon, D. W. McKinstry, and W. Thomas. (Partly coop. U. S. D. A.). (*Pennsylvania Sta. Bul. 367 (1938), pp. 7, 8, 16, 17, 18, 19–21, 22, 23, 24, 32, 38, 39, 44, 48, fig. 1*).—Agronomic studies, reported on briefly, included breeding work with potatoes, wheat, oats, soybeans, grasses, and red clover; inheritance studies with red clover; variety trials with wheat, corn (and hybrids), oats, barley, potatoes, soybeans, and alfalfa; effects of soil reaction and planting date on yield and

cooking quality of potatoes; foliar diagnosis of the nutrition of corn and potatoes (E. S. R., 80, p. 188); research on microflora associated with fermentation of cigar-leaf tobacco during curing; fertilizer experiments with tobacco, hay, and turf grasses; response in hay yields to nitrogen carriers on limed and unlimed soil; and studies of soil acidity tolerance of strains of red clover and *Rhizobium trifolii*.

[**Agronomic research in South Carolina**], G. B. KILLINGER, H. P. COOPER, R. W. WALLACE, J. B. EDMOND, H. J. SEFICK, C. H. ARNDT, G. M. ARMSTRONG, C. C. BENNETT, B. S. HAWKINS, C. S. PATRICK, E. D. KYZER, J. E. LOVE, W. H. JENKINS, E. E. HALL, J. R. MATTISON, W. W. KIRVEN, F. M. HARRELL, J. D. McCOWN, W. M. LUNN, H. A. McGEE, J. A. RILEY, N. McKAIG, JR., W. A. CARNS, A. B. BOWEN, E. M. ROLLER, L. E. SCOTT, E. W. FAIRES, W. C. BARNES, R. L. SMITH, J. M. JENKINS, JR., and W. B. ROGERS. (Partly coop. U. S. D. A. et al.). (*South Carolina Sta. Rpt. 1938, pp. 33–41, 46–52, 61–63, 85, 87–89, 94, 99–103, 105–114, 125–129, 132–136, 144–150, 151–156, 159, 160, 162–167, 167–172, 177, 179, 181, 182, 184–186, figs. 3*).—Progress reports are made again (E. S. R., 79, p. 322) from field crops experiments at the station and substations, including variety tests with cotton, corn, oats, wheat, grain sorghum, sorgo, sugarcane, cowpeas, soybeans, sweetpotatoes, potatoes, and crotalaria species; tests of kudzu and of different green manure crops for truck soils; breeding work and genetic studies with cotton; hybridization experiments with sea-island and upland cotton; fertilizer experiments with potatoes, sweetpotatoes, and soybeans; response of potatoes to limestone and basic slag; fertilizer and nutrition studies with cotton dealing with placement, time and rate of applying potassium and other fertilizers, potassium carriers with and without lime and magnesium sulfate, acid-forming v. non-acid-forming fertilizers, and rates of stable manure in the drill; the comparative value of a cover crop of rye and hairy vetch, fresh manure, and their combination in production of cotton; cottonseed storage experiments; studies of variation in fiber length in several lines of Super-Seven cotton; tobacco experiments, including effects of various rotations, rates and forms of potassium fertilizers, and fertilizer formulas recommended for bright flue-cured tobacco and plant beds; sweetpotato experiments concerned with yields from vine cuttings v. sprouts of the same parentage, nutrient deficiency symptoms, and effect of time of planting and spacing on yields of the Porto Rico variety; comparison of Biloxi soybeans, Otootan soybeans, and cowpeas for hay; Biloxi soybeans with four varieties of sorgo for silage; and establishing and maintaining lespedeza and white clover in carpet grass pasture.

[**Agronomic investigations in Texas**], W. H. FRIEND, E. B. REYNOLDS, H. E. REA, D. T. KILLOUGH, T. R. RICHMOND, R. E. HARPER, G. T. McNESS, R. H. WYCHE, H. M. BEACHELL, R. E. DICKSON, B. C. LANGLEY, C. E. FISHER, P. C. MANGELSDORF, R. G. REEVES, H. P. SMITH, D. L. JONES, P. R. JOHNSON, R. H. STANSEL, P. B. DUNKLE, V. L. CORY, W. H. DAMERON, R. E. KARPER, J. R. QUINBY, G. S. FRAPS, R. L. HENSEL, J. H. JONES, E. S. McFADDEN, P. A. YOUNG, J. J. TAUBENHAUS, R. A. HALL, C. H. McDOWELL, I. M. ATKINS, F. GAINES, J. J. BAYLES, H. F. MORRIS, E. K. CROUCH, J. C. STEPHENS, G. H. GODFREY, L. E. BROOKS, and E. MORTENSEN. (Partly coop. U. S. D. A. et al.). (*Texas Sta. Rpt. 1937, pp. 36, 67–84, 86–93, 94, 95, 107, 115, 166–169, 170–173, 179–181, 182–186, 187–191, 198–206, 207–209, 210–219, 220–222, 230–232, 232–234, 236, 238–242, 249–256, 257, 258, 260–262, 265, 266, 277, 279, 280, 284–290, 302, 303*).—Results are again reported briefly from agronomic and plant breeding experiments (E. S. R., 79, p. 42) at the station and substations, including varietal tests with cotton, corn (and corn hybrids), wheat, oats, barley, rice, grain sorghum, sorgo, sugarcane for sirup, flax, peanuts, soybeans, cowpeas, velvetbeans, alfalfa, lespedeza, clover,

bur clover, sweetclover, vetch, winter peas, sesame, crotalaria, potatoes (seed stock), and miscellaneous winter and summer legumes and grasses; growing of spineless cactus (*Opuntia ellisiana*); breeding work with cotton, wheat, oats, barley, corn, rice, grain sorghum, Sudan grass, sorgo, broomcorn, sorghum for popping, cowpeas, buffalo grass, and peanuts; development of cotton varieties adapted to mechanical harvesting; inheritance studies with cotton, corn, broomcorn, and different sorghums; studies of the genetic and cytological relationships of corn, *Euchlaena*, and *Tripsacum*; hybrid vigor in sorghum; cultural (including planting) tests with cotton, corn, oats, rice, grain sorghum, Sudan grass, buffalo grass, flax, soybeans, sweetclover, sesame, and potatoes; effects of interplanting corn and grain sorghum and sweetclover with Sudan grass and with oats; treatment of cottonseed; dusting sulfur on peanut vines; seedbed preparation studies; comparisons of corn and sorghums; effects of grain sorghum and corn on succeeding small grain crops; irrigation tests with grain sorghum and cotton; studies of artificial plats for field experiments in soil improvement; numerous crop rotation and sequence experiments; fertilizer trials with crops in rotation, corn, wheat, oats, rice, potatoes, grain sorghum, pasture, sugarcane, and cotton; methods of applying fertilizers for cotton and rice; effects of fertilizers on germination of rice seed; tolerance of rice to different soil reactions adjusted with lime and sulfur; polyhalite as a source of potassium for fertilizers; nitrogen sources for cotton and corn; cotton burs v. manure as cotton fertilizers; continuous cotton v. cotton grown from two-thirds to one-fourth of the period in rotation; green manures for cotton, corn, potatoes, and other crops; inoculation studies with soybeans and other legumes; rice weed control with sulfuric acid solutions; soil fertility and improvement studies; hairy vetch for soil improvement; germination and longevity of the seed and control of bitterweed; control of Johnson grass and nutgrass with chloropicrin; control of pricklypear and pasture weeds; production and germination of buffalo grass seed and establishment of buffalo grass pasture; and other pasture improvement and management investigations concerned with plants and seeds mixtures for different types of pasture, effects of fertilizer treatments on yield and chemical and botanical composition of herbage, introduction of new grasses and legumes and sods for observation, grazing tests with new grasses, inoculation tests with pasture legumes, combination woodland and pasture studies, different rates of phosphate on strains of Subterranean clover, effects of fertilizers and oak ashes and of mineral fertilization on establishment and survival of clovers, both on native pasture, and influence of deferred grazing on increase of desirable winter-growing range plants.

Irrigation of small grain at germination may reduce yield as much as 10 percent, D. W. Robertson (*Colo. Farm Bul.* [*Colorado Sta.*], *1* (*1939*), *No. 1, pp. 5–7*).—Experiments with wheat, largely noted earlier (E. S. R., 78, p. 348), showed that too early an irrigation of small grain may reduce yields about 10 percent because the irrigation water carries the available nitrogen below the feeding area of the roots.

Alfalfa in Colorado, D. W. Robertson, R. M. Weihing, and O. H. Coleman (*Colorado Sta. Bul. 450* (*1938*), *pp. 26, figs. 7*).—Cultural, irrigation, and harvesting practices and varieties, based on results of experiments and experience over an extended period, are suggested for growing the crop in Colorado. Titles of 40 station contributions on alfalfa, 1888–1937, are appended.

Recommendations include a level, smooth, well-prepared seedbed; spring planting or early fall planting in July or August; from 8 to 10 lb. of good clean seed drilled from 0.5 to 1 in. deep or broadcasted and the land harrowed or packed, and either sown alone or with a companion crop of field peas or flax;

and irrigation depending on water supply and soil type. The hay should be cut in from one-tenth to one-fourth bloom and raked into windrows when wilted, allowed to cure partially in the windrow, and while still a little damp, either bunched or cocked and allowed to cure, and stacked in high well-peaked stacks. Varietal recommendations include Meeker Baltic for short rotations, with Grimm and Hardistan second, and Hardistan for long rotations where a stand (E. S. R., 79, p. 619) of alfalfa is to be kept longer than 3 yr.

Ladino clover for western Oregon, H. A. Schoth. (Coop. U. S. D. A.). (*Oregon Sta. Circ. 129 (1938), pp. 8, figs. 2*).—Practical suggestions for growing Ladino clover (*Trifolium repens latum*) based on the cooperative experiments and observations consider environmental needs, seedbed preparation, seeding mixtures and practices, fertilizer and irrigation requirements, and methods of managing pasture and handling the crop for hay and seed.

Illinois corn performance tests, 1938, G. H. Dungan, A. L. Lang, J. H. Bigger, B. Koehler, and O. Bolin. (Coop. U. S. D. A. et al.). (*Illinois Sta. Bul. 450 (1939), pp. 225–272, figs. 5*).—The 246 kinds of corn (E. S. R., 78, p. 776) compared on 10 fields in 1938 included 219 hybrids and 27 open-pollinated varieties. The number of entries in each field was limited to 60, which included 5 adapted open-pollinated varieties selected to serve as a check.

The 5 best hybrids on all 10 fields surpassed the best 5 open-pollinated varieties by an average of 15.5 bu. per acre and by 13.2 in percentage of erect plants. The 5 hybrids excelled in 9 fields in yield of sound corn and on all fields in percentages of erect plants. In the 2 northern and 1 central sections even the 5 poorest hybrids on the average outyielded the 5 open-pollinated corns. Two- and 3-yr. summaries of results in several northern and central sections show that certain hybrids were definitely superior to adapted open-pollinated varieties, but the advantage was small or nil in the more southern sections.

Dropped ears were appreciable only in 2 fields, at Reddick 0.92 percent and Littleton 0.55 percent; 15 hybrids in the Reddick field and 10 hybrids in the Littleton field dropped 1 percent or more of their ears. Many hybrids were above average in resistance to two species of corn rootworms, the only insects causing noteworthy damage on the 1938 fields. A combination of Stewart's disease and *Diplodia* stalk rot reduced yields as much as 50 percent in some localities in 1938, most severely in south-central Illinois. With exceptions, the high-yielding hybrids appeared to be more susceptible to the above disease complex than lower-yielding hybrids. Disease susceptibility seemed to be correlated most highly with earliness of maturity.

Soil adaptation tests in 1938 continued to demonstrate the need for fertile soil to take full advantage of the high productiveness of good hybrids. However, yield alone is not always a complete index to the adaptability of a variety or hybrid to a given soil, for lodging, type of ear, and kernel formation may also be influenced greatly by productivity level.

The 1938 Iowa corn yield test, M. S. Zuber and J. L. Robinson. (Coop. U. S. D. A. et al.). (*Iowa Sta. Bul. 379 (1939), pp. 77, fig. 1*).—The 1,110 entries made in the 12 fields of the 1938 Iowa corn yield test were grown cooperatively in the same groupings and in a similar growing season as in 1937 (E. S. R., 79, p. 45). Hybrid corn averaged in yield 16.9 percent more than open-pollinated varieties, and the greatest relative increase was in the 2 districts suffering most from drought. An experimental hybrid yielded highest in 8 districts, a regular hybrid in 3, and the highest yielding regular and experimental hybrids were equal in 1 district. The lowest yielding entry in 7 districts was an experimental hybrid, in 4 districts an open-pollinated corn, and in 1 district a regular hybrid. An excessive number of the better performing

combinations in the northern and north-central sections had moisture contents above the average open-pollinated strains. Data on variations among hybrids again emphasized the fact that many of the commercial hybrids on the market can be regarded as mediocre to poor.

Section entries with highest performance scores in the regular open-pollinated, regular hybrid, and experimental hybrid classes, respectively, were for the northern section Kossuth Reliance, Pioneer Hi-Bred 349, and Funk Hybrid G-114; for the north-central section Iowill, Funk Hybrid G-53, and Feldcorn 853; for the south-central section Coppock Utility, Pioneer Hi-Bred 313, and Iowa Hybrid 3110; and for the southern section Krug, Dekalb 827, and Iowa Hybrid 3395. Because of its performance in the northern section, the grower of Pioneer Hi-Bred 349 was awarded a trophy for the regular section entry having the highest performance score.

Corn hybrids for Missouri, G. F. SPRAGUE. (Coop. U. S. D. A.). (*Missouri Sta. Circ. 201 (1939), pp. 27, figs. 23*).—Methods of producing and testing hybrid corn are outlined, and its value and limitations are pointed out. Hybrids recommended for Missouri from results of performance tests include Missouri No. 8 and No. 47 for culture throughout the State, with No. 47 usually excelling in northern Missouri, and Iowa 13 for extreme northern Missouri.

Progress report on fertility investigations with peanuts in 1938, E. R. COLLINS and H. D. MORRIS (*North Carolina Sta. Agron. Inform. Circ. 117 (1939), pp. [7], figs. 5*).—In the first year of studies on four soil types in five fields in the peanut belt in eastern North Carolina, peanuts responded in yield increases to gypsum only on two Dunbar-Lenoir fine sandy loams with respective pH values of 5.9–6.1 and 4.6–4.8, to lime only on the latter soil, to potassium alone only on Norfolk very fine sandy loam, to phosphorus on no soils with increased yield but with a decrease on Ruston loamy sand, and to potassium alone and to 300 lb. per acre of a 2–8–4 fertilizer only on the Norfolk soil.

Reseeding with grasses native to Colorado increases forage crops on depleted ranges, E. W. NELSON and C. H. WASSER (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 1, pp. 9–13*).—Reseeding practices suggested as productive on depleted ranges in different parts of the State include good soil, drilling seed of adapted grasses from 0.75 to 1.5 in. deep—preferably 1 in. deep and early on well-prepared seedbeds, seeding in high stubble where soil blowing occurs or after vegetation is removed in nonblowing areas, mowing weeds on newly seeded areas, where practicable, at least twice a year, and permitting no grazing in the first year after seeding. Improvement by better grazing systems should be tried before artificial reseeding is attempted.

How to keep and increase black grama on southwestern ranges, R. S. CAMPBELL and E. C. CRAFTS. (Coop. Univ. Ariz.). (*U. S. Dept. Agr. Leaflet 180 (1939), pp. 8, figs. 5*).—Management and utilization practices are outlined and the means of spreading are described for black grama grass (E. S. R., 71, p. 465), considered essential to southwestern ranges because of its wide occurrence, forage value, and use in soil conservation.

HORTICULTURE

[Horticultural studies by the Alabama Station], L. M. WARE, H. HARRIS, and E. W. MCELWEE (*Alabama Sta. Rpt. 1937, pp. 26–29*).—Reports are presented on the following studies: The effect of various sources of nitrogen upon the yield of vegetable crops, varieties of muscadine grapes, and the influence of photoperiod modification on the flowering of the chrysanthemum and aster.

[Horticultural studies by the Iowa Station], B. B. SPROAT, A. F. DODGE, E. W. LINDSTROM, E. C. VOLZ, T. J. MANEY, B. S. PICKETT, H. H. PLAGGE, H. L. LANTZ, A. T. ERWIN, E. S. HABER, and N. D. MORGAN (*Iowa Sta. Rpt. 1938, pts. 1, pp. 147, 148, 149, 150, 164–178, 179, 181, 182, 183, 184, 186, 187, figs. 2; 2, pp. 33, 41*).—In part 1, the following studies are discussed: Conservation nursery cultural practices; inheritance of fruit size and shape in tomatoes; varieties of iris; growing of uniform stocks for propagating the apple; development of new stocks, particularly dwarfing stocks, for apples; soil management of apple orchards; response of apple varieties to storage temperatures; breeding apples, pears, and plums; species crosses to develop hardy peaches; new apple varieties; breeding of anthracnose-resistant black raspberries; storage of the Jonathan apple with respect to control of functional disorders; varieties and soil management of strawberries in southeastern Iowa; stock-on-scion influences in the apple; vegetative propagation of woody plants as related to juvenile and mature tissues; breeding and testing of rose stocks; growth-promoting substances as aids to propagation by cuttings; culture of asparagus; commercial fertilizer v. manure for muskmelons; substitute crops for cabbage and melon "sick" soils in southeastern Iowa; varieties of vegetables and muskmelons; and ecological factors affecting the growth of asparagus.

Part 2 takes up sweet corn breeding and the nature of drought resistance in inbred and hybrid lines of sweet corn.

[Horticultural studies by the Maine Station], M. T. HILBORN, R. M. and D. M. BAILEY, J. A. CHUCKA, S. M. RALEIGH, I. M. BURGESS, D. FOLSOM, F. B. CHANDLER, and I. C. MASON (*Maine Sta. Bul. 391 (1938), pp. 243–256, 306–311, figs. 2*).—Among studies the progress of which is discussed are the nature, causes, and prevention of winter injury to apple trees; sweet corn breeding, spacing, and fertilization; breeding and planting rates of beans; vegetable variety trials; development of scab-resistant cucumbers; boron deficiency in rutabagas, cauliflower, and related plants; breeding and variety trials with small fruits; and blueberry fertilization, culture, weed control, and propagation.

[Horticultural studies by the Pennsylvania Station], J. W. SINDEN, C. E. MYERS, M. T. LEWIS, W. B. MACK, W. THOMAS, R. D. ANTHONY, F. N. FAGAN, C. O. DUNBAR, N. F. FARRIS, H. K. FLEMING, H. W. THURSTON, E. I. WILDE, R. P. MEAHL, G. J. STOUT, E. M. RAHN, and F. W. HALLER (*Pennsylvania Sta. Bul. 367 (1938), pp. 34, 35, 47–50, 51, 52, 53, 54, fig. 1*).—Included are brief reports on studies in mushroom culture; inbreeding of sweet corn; tomato, rhubarb, and lettuce breeding; fertilization of truck crops; foliar diagnosis of crop nutrition; soil management in peach orchards; apple storage and use of growth-promoting substances in apple propagation; breeding of snapdragons; testing of ornamentals; and the asexual production of ornamentals with growth-promoting substances; variety and strain tests of celery, beets, carrots, cabbage, peas, beans, peppers, and tomatoes.

[Horticultural studies by the Oklahoma Station], V. G. HELLER, F. B. CROSS, H. B. CORDNER, F. A. ROMSHE, G. F. GRAY, R. L. SCOTT, and E. L. HARTMAN (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. 3, 4, 98–100, 101–103, 105–111, 115–134, figs. 9*).—Included are brief reports on the following studies: Effect of saline waters on greenhouse plants; effect of growth-promoting substances on root formation in cuttings and young pecan trees; management of pecan groves; varieties of pecans; grafting waxes for covering propagation wounds; varieties, irrigation, and fertilizers for vegetables; use of cloth houses for tomato growing; irrigation and fertilizer for strawberries; varieties of small fruits; comparative transpiration rates of different strawberry varieties; varieties of tree fruits and grapes; causes of uneven ripening of grapes; soil media for greenhouse flowers; and varieties of tomatoes for greenhouse culture.

[**Horticultural studies by the Oregon Station**] (*Oregon Sta. Circ. 130 (1938), pp. 2, 3, 19, 20, figs. 8*).—Included are progress reports on the following investigations: The handling and storage of rose plants, ethylene as a cause of premature defoliation of holly, use of growth hormones in propagation, the preservation of peony blooms, and the culture and handling of hops.

[**Horticultural studies by the South Carolina Station**], A. M. MUSSER, L. E. SCOTT, J. M. JENKINS, JR., and W. C. BARNES (*South Carolina Sta. Rpt. 1938, pp. 52–54, 74, 75, 157–159, 160–162, 172–176, 178, 179–181, 182–184, 188, 189, figs. 5*).—Brief reports are presented on the progress of studies relating to fruit varieties, particularly peaches, grapes, and berries; fertilizers and cover crops for peaches; grape rootstocks; breeding of spineless okra and of cabbage; varieties and fertilization of vegetables, with particular reference to asparagus, beans, peas, tomatoes, cucumbers, watermelons, and cantaloups.

[**Horticultural studies by the Texas Station**], S. H. YARNELL, J. F. ROSBOROUGH, H. F. MORRIS, J. C. RATSEK, W. H. FRIEND, E. MORTENSEN, J. F. WOOD, G. H. GODFREY, H. M. REED, R. H. STANSEL, W. S. FLORY, L. E. BROOKS, L. R. HAWTHORN, R. A. HALL, R. H. WYCHE, D. L. JONES, J. J. BAYLES, and W. H. DAMERON. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1937, pp. 29–36, 36–39, 169, 173–175, 186, 187, 191, 192, 232, 237, 242, 243, 244, 245, 260, 273–277, 277–279, 280, 281, 290–293, 294–301, 302*).—Included are brief reports on studies relating to fruit, ornamental, and vegetable adaptation; culture of the blackberry and rose; rootstocks for citrus; citrus breeding, fertilizing, culture, and storage; date varieties and propagation; chromosome structure of the Meyer lemon; breeding and processing of the fig; grape rootstocks and pollination; peach, plum, blackberry, dewberry, and strawberry breeding; orchard heating; development of vegetables for canning and freezing; vegetable culture and fertilization; types of vegetables; cabbage breeding; crucifer hybridization; vernalization of cabbage seed; storage of cucumbers; factors influencing the quality and yield of onions and spinach; tomato breeding and pruning; the cause and nature of puffing in the tomato; breeding of ornamentals, including the oleander, oak, and rose; use of growth-promoting substances for cuttings of oak, plum, peach, etc.; the chromosome structure of oak and *Habranthus robustus;* and fertilizer and adaptation studies with tung oil and slash pine trees.

The water-culture method for growing plants without soil, D. R. HOAGLAND and D. I. ARNON (*California Sta. Circ. 347 (1938), pp. 39, pls. 4, figs. 7*).—This is a presentation of information as to the historical background and development of the growing of plants in water solutions containing essential mineral nutrients for growth. In discussing the economic possibilities of water culture, the authors state that "indispensable to profitable crop production by the water-culture method is a general knowledge of plant varieties, habits of growth, and climatic adaptations of the plant to be produced, pollination, and control of disease and insects; in other words, the same experience now needed for successful crop production in soils." Formulas for the preparation of nutrient solutions are suggested.

Plant injection for the diagnosis of mineral deficiencies, B. F. G. LEVY (*Sci. Hort.* [*Wye, Kent, Eng.*], *7 (1939), pp. 50–59, figs. 9*).—This is a discussion of technic.

[**Vegetable studies by the Cornell Station**], C. H. MYERS, R. A. EMERSON, H. C. THOMPSON, A. G. NEWHALL, P. H. WESSELS, R. H. WHITE-STEVENS, H. S. CUNNINGHAM, J. E. KNOTT, G. J. RALEIGH, R. L. CAROLUS, C. H. DEARBORN, O. A. LORENZ, H. PLATENIUS, P. WORK, and C. L. VINCENT ([*New York*] *Cornell Sta. Rpt. 1938, pp. 127, 156–160, 161, 162*).—Included are reports on the following studies: Breeding cabbage for yield and uniformity; breeding celery of self-blanching types for quality, disease resistance, and yield; asparagus spacing;

fertilizer requirements of vegetables; green-manure and cover crops; soil reaction for vegetable crops; crop adaptation and soil management for vegetables grown on muck soils; lettuce improvement; soil deficiencies for vegetables and the use of borax; storage and precooling of vegetables on the farm; and vegetable handling and storage.

The vegetable growing business, R. L. and G. S. WATTS (*New York: Orange Judd Pub. Co., 1939, pp. XVII+549, figs. 148*).—This is a comprehensive treatise devoted to the principles and practices of growing and marketing vegetables.

Problems in the production of Iceberg lettuce in New York, J. E. KNOTT, E. M. ANDERSEN, and R. D. SWEET (*[New York] Cornell Sta. Bul. 714 (1939), pp. 17, figs. 6*).—Of varieties and strains of Iceberg lettuce tested at several locations, a hybrid known as Imperial 44 and developed by the U. S. Department of Agriculture showed unusual capacity for producing firm, marketable heads even under conditions that greatly reduced heading in other varieties. Imperial 44 was found slower to bolt than any other strain of the same type tested. As grown on well-decomposed muck soil, it had a much more spreading root system and fewer deep roots than White Boston, indicating a better feeding but possibly a poorer water-collecting capacity. Wider spacing than is usually allotted lettuce was needed to produce large heads of the Iceberg type. Too abundant feeding with too quickly available N made for poorer heading and greater susceptibility to tipburn. Water supply was apparently a vital factor, and a plentiful and relatively constant supply is considered essential for good heading. It is believed that water may be helpful in part by overcoming, to some degree, the detrimental effects of high temperatures. On most muck soils a water table of from 18 to 24 in. should provide sufficient moisture without saturating the soil. Suggestions as to fertilization on muck and mineral soil are given. Imperial 44, notwithstanding its susceptibility to tipburn and failure to head under extreme temperatures, is conceded the best variety of Iceberg lettuce yet introduced into the State.

The effect of temperature on the photoperiodic response of spinach, J. E. KNOTT (*[New York] Cornell Sta. Mem. 218 (1939), pp. 38, figs. 10*).—Although a complete interacting range of both temperature and photoperiod was not included in the study, the data suggested that for spinach the photoperiod may be less important than temperature in determining the reproductve response. The photoperiod necessary to cause the appearance of seedstalks was apparently determined by the temperature during early growth complemented by the temperature prevailing during the later stages of development. In the case of plants growing under a 15-hr. photoperiod and exposed to three temperature ranges, namely, from 50° to 60° F., 60° to 70°, and 70° to 80°, the 60°-to-70° lot was the earliest to initiate seedstalks. At from 40° to 50° and 15 hr. of light, plants made little growth, but when subjected to favorable temperatures they developed seedstalks sooner than did those plants not subjected to an initial low-temperature treatment. Under both the 15-hr. and the natural photoperiod, the higher the temperature at which the plants were growing the sooner after the completion of the initial treatments did the blooms appear. The rate of elongation of seedstalks was influenced by the prevailing sunshine, photoperiod, and temperature in descending order. The possible role of temperature in the production of a flower-promoting hormone is discussed. The fact that spinach exposed to a 7-hr. day at from 60° to 70° did not form seedstalks until March 14 following the planting on October 11 may have been due to the slow production of the hormone. The relation of the observations to the behavior of spinach in the field is indicated.

The modification of flower structure by environment in varieties of Lycopersicum esculentum, F. S. HOWLETT. (Ohio Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 2*, *pp. 79–117*, *figs. 14*).—A study of the flowers of fifty-odd varieties and strains of tomato showed a definite response to environment with respect to the relative length of the pistils and stamens. The change in relative length of the two organs was largely due to variation in the length of the pistil. The ovary, as well as the style, was concerned in change in the pistil length, but the style was usually the more important factor. Differences occurred among varieties as to the extent or degree to which the relative length of the pistils and stamens varied in response to environment. In certain varieties in which the pistil was enclosed within the staminal cone the effect of environment was masked. A classification of a number of varieties based on the relation of the length of pistils to that of stamens is presented. The maximum length of the pistils in relation to stamens was attained in plants grown during a period of relatively short daylight, under light of low intensity, and with an abundance of readily available N. On the contrary, short pistils in relation to stamens were produced when the days were long, the light of high intensity, and the supply of N only moderate. Increased length of pistils in relation to stamens is believed to be associated with, if not due to, carbohydrate deficiency. It is suggested that the differential response of the two sex organs is due to differences in their physiological mechanisms.

[**Pomological studies by the Cornell Station**], D. BOYNTON, A. J. HEINICKE, M. B. HOFFMAN, J. I. DEVILLIERS, L. H. MACDANIELS, E. M. HILDEBRAND, A. B. BURRELL, D. S. WELCH, R. M. SMOCK, and A. J. LOUSTALOT ([*New York*] *Cornell Sta. Rpt. 1938, pp. 138–143*).—The following studies are discussed: Lack of oxygen in the soil atmosphere as related to apple tree rooting and productivity; influence of different kinds and amounts of mulch material on the growth and fruiting of apple trees; influence of fertilizer placement on the growth and fruiting of apple trees; growth and activity of roots of fruit trees under varying soil and cultural conditions; effect on the set of fruit of spraying and dusting apple blossoms with various fungicides and bactericides; wound dressings for fruit trees, with special reference to trees damaged by winter injury; the structure of the flowers of apple, pear, and quince, with special reference to the occurrence of stomata and the cutinization of various floral parts; effects of freezing on the roots and other tissues of fruit plants; relation of climatic, soil, and cultural conditions and maturity of apples to storage; comparative efficiency of oiled wrappers and shredded oiled paper and different waxes in the control of apple scald and shriveling; effect of different low but nonfreezing temperatures on the keeping quality of apples; effect of modified storage atmospheres on the keeping quality of apples; cause and control of bitter pit in apples; factors influencing the red color formation in fruits during and after harvest; removal of spray residue from cherries; and the photosynthetic activity of apple foliage under natural conditions and as influenced by cultural practices, with special reference to spraying and fertilization.

Soils in relation to fruit growing in New York.—XIV, Tree behavior on important soil profiles in the Finger Lakes area, D. BOYNTON ([*New York*] *Cornell Sta. Bul. 711* (*1938*), *pp. 21*, *figs. 20*).—Continuing this series (E. S. R., 80, p. 593), a discussion is given on the growth of apple and cherry trees on different types of soil. As indicated previously, soil conditions exert a profound influence on the tree and its roots. Trees on Ottawa loamy fine sand developed deep and extensive roots and vigorous tops. Dunkirk silty clay was also satisfactory where the surface drainage was good. Honeoye, Lansing and

Darien soils were adequately drained but were sometimes underlaid less than 3 ft. below the surface with an extremely compact, unweathered glacial-till subsoil. Ontario loam proved satisfactory in the area studied. Lyons silt loam showed slow internal drainage and compact, shallow subsoil distinctly unfavorable to the Rhode Island Greening apple. Where Lansing and Darien soils were underlaid with bedrock closer than 3 ft. to the surface, growth of trees was reduced and mortality became a factor. In the very dry summer of 1936 sweet cherries on this type of soil suffered serious losses. The importance of examining soils prior to setting out orchards is stressed.

[Leaflets on fruit growing] (*U. S. Dept. Agr. Leaflets 170 (1939), pp. 8; 172, pp. 5; 173, pp. 5, figs. 4; 178, pp. 8; 179, pp. 6*).—General information is presented on the following subjects: Nos. 170, Date Growing in the United States, by R. W. Nixon and D. C. Moore; 172, Why Fruit Trees Fail to Bear, by H. P. Gould; 173, The Bud-Graft Method of Propagating Vinifera Grape Varieties on Rootstocks, by E. Snyder and F. N. Harmon; and 178, Dwarf Fruits, and 179, The Native Papaw, both by H. P. Gould.

The storage of sweet cherries as influenced by carbon dioxide and volatile fungicides, F. Gerhardt and A. L. Ryall (*U. S. Dept. Agr., Tech. Bul. 631 (1939), pp. 20*).—An increase in the CO_2 content of the storage atmosphere was found effective in prolonging the useful life of freshly harvested sweet cherries. Bing and Lambert varieties were held without impairment of dessert quality for 12 days at 60° F. in 40 percent, 20 days at 45° in 40 percent, or 31 days at 32° in 10 percent of CO_2. Since satisfactory mold control was obtained at 45° in 25 percent of CO_2, concentrations of 40 percent supplied a wide margin of safety. At 60° or above, CO_2 storage in concentrations sufficient to inhibit mold formation impaired flavor. In firmness, brightness, and freedom from decay, gas storage at 45° and 20 percent of CO_2 up to 20 days was found preferable to air storage at 32°. Surface pitting was reduced by storage in atmospheres containing 15 and 25 percent of CO_2.

Of various volatile chemicals used for impregnating packaging materials, elemental iodine alone showed any promise. Fruit flavor was not altered by the use of iodine wraps, but when used in sufficient concentrations to control decay there resulted lenticel injury and surface pitting, particularly in the light-colored Napoleon. Iodine injury was less apparent in fruit stored at 45° than at 65°. The use of iodine in connection with CO_2 storage is not warranted since the CO_2 alone was adequate to control decay. None of the organic compounds carrying iodine were as effective fungicides as iodine alone. The possibility of using CO_2 at transit temperatures during freight shipments of cherries is discussed.

The Northstar strawberry, G. M. Darrow (*U. S. Dept. Agr. Circ. 517 (1938), pp. 2, fig. 1*).—Originated as a cross between Howard 17 and Redheart, this new variety is introduced for growing in the northern United States. The plants are productive and the fruit is large, firm, and of high dessert quality.

Correlations between size of seed, seedling, and nursery tree in the avocado, R. W. Hodgson and E. R. Eggers. (Univ. Calif.). (*Calif. Avocado Assoc. Yearbook, 1938, pp. 92–96, fig. 1*).—Further statistical studies (E. S. R., 80, p. 347) of the seeds and resulting seedlings showed that under like conditions large seeds tend to produce large seedlings, and vice versa. When budded with known varieties the large seedlings tend to produce larger nursery trees. Trees resulting from the autumn start of buds were larger and more uniform than those started in the spring.

Water content of avocado fruit and leaves, A. R. C. Haas. (Calif. Citrus Expt. Sta.). (*Calif. Avocado Assoc. Yearbook, 1938, pp. 97–102, figs. 2*).—Data

taken on fruit and leaves of three varieties, Fuerte, Dorothea, and Puebla, showed varietal and seasonal differences in moisture content. Throughout most of the season the water content of the pulp was greater in Fuerte than in Dorothea fruits, but about the first of February the water contents of all three were almost alike. The percentage of water content in Fuerte seeds was usually greater than in the other two varieties. As to leaves, there was noted, in samples collected January 12, a relatively high water content in varieties usually known to be tender.

A promising method for distinguishing between Mexican and Guatemalan avocado bark, F. F. Halma and E. R. Eggers. (Univ. Calif.). (*Calif. Avocado Assoc. Yearbook, 1938, pp. 107, 108*).—When water was added to powdered bark, the bark of the Mexican group formed a coagulated or viscous mass, while that of the Guatemalan varieties remained more or less granular. Hybrids, such as Fuerte, behaved more like their Guatemalan parents.

[Ornamental horticulture at the Cornell Station], K. Post, E. P. Hume, M. W. Nixon, R. C. Allen, A. M. S. Pridham, J. C. Swartley, and H. T. Skinner (*[New York] Cornell Sta. Rpt. 1938, pp. 121, 122*).—Brief progress reports are given on the following studies: Photoperiodism of chrysanthemums, effects of increasing the length of day by the use of electric light of varying types and intensities upon the growth and time of flowering of greenhouse plants, conditions affecting the keeping of dahlia roots in storage, the culture of hardy bulbs, the propagation of conifers, and the propagation of rhododendrons and other ericaceous plants by cuttings.

House plants may be successfully grown if simple rules are carefully followed, W. E. Gunesch (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 1, pp. 15, 16*).—Discussing the essential requirements for house plants, the author presents brief notes on the specific needs of various plants, including the begonia, Boston fern, cyclamen, poinsettia, primrose, etc.

FORESTRY

An introduction to American forestry, S. W. Allen (*New York and London: McGraw-Hill Book Co., 1938, pp. VIII+402, figs. [129]*).—The history and development of forestry in the United States is discussed from both the commercial and public viewpoints.

[Forestry studies by the Iowa Station], G. B. MacDonald, B. B. Sproat, and A. F. Dodge (*Iowa Sta. Rpt. 1938, pt. 1, pp. 146–148*).—Included are reports on studies relating to the growing of trees and other plants for erosion control and to estimating the growth of timber species.

[Forestry studies by the Cornell Station], R. F. Chandler, Jr., J. N. Spaeth, M. Afanasiev, and E. F. Wallihan (*[New York] Cornell Sta. Rpt. 1938, pp. 84, 85, 123–125*).—Included are brief progress statements on the following projects: The calcium requirements of different tree species; the influence of certain mineral fertilizers upon the composition and growth of forest trees; the influence of soil type upon the growth of black-locust plantations; management of second-growth forest types; improved practice in the production of forest planting stock of broadleaved timber-tree species; establishment, culture, and development of forest plantations; and the influence of forest trees on the occurrence and growth of the subordinate vegetation in the forest.

[Forestry investigations by the Pennsylvania Station], W. E. White, H. O. Triebold, and D. D. Stevenson (*Pennsylvania Sta. Bul. 367 (1938), p. 45*).—Brief reports are given on studies in the propagation of hardwoods, and the factors affecting the flow of maple sap.

Forest resources of southeastern Texas, J. W. Cruikshank and I. F. Eldredge (*U. S. Dept. Agr., Misc. Pub. 326 (1939), pp. VI+37, pl. 1, figs. 16*).—Information is presented on physical features, character of the forests, contents of saw timber and cordwood, ratio of increment to drain, and special-use resources, such as naval stores and pulpwood.

Forest tree breeding technique, E. J. Schreiner. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 7, pp. 712–715, figs. 6*).—Procedure and equipment are described.

Underplanting hardwoods with pines, D. J. Weddell (*Alabama Sta. Rpt. 1937, p. 30*).—Data are presented on the comparative growth of several pines planted under hardwoods and in the open.

Soil-fertility standards for growing northern conifers in forest nurseries, S. A. Wilde. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 12, pp. 945–952*).—Knowing that recently cleared but not burned-over forest land, which had supported a mature or nearly mature stand of satisfactory growth, always produces at least one crop of vigorous nursery seedlings, the author studied 500 samples of soil collected beneath thrifty stands of *Pinus banksiana*, *P. resinosa*, *P. strobus*, *Picea glauca* (=*P. canadensis*), *Abies balsamea*, and mixed stands of *Acer saccharum*, *Tilia americana*, and *Betula lutea*. Soil collected from barren areas was also included as a basis of comparison. Data are presented with relation to pH values, silt and clay fractions, base exchange capacity, total nitrogen, nitrates, ammonia, available phosphorus and potassium, and replaceable calcium and magnesium. The soils from beneath the thrifty conifers showed an NPK ratio of about 1–2–5. Greenhouse studies showed that nitrogen content should not exceed 2–2–5. On the basis of the study, the author suggests moderation in the use of nitrogen salts on forest seedlings, with reliance on the appearance of the foliage as an indicator of nitrogen needs. Luxuriant vegetative growth may not indicate the most desirable status with respect to resistance to disease or unfavorable environments.

A resurvey of the demonstration prairie shelterbelts in Minnesota, H. L. Hansen and H. Schmitz (*Minnesota Sta. Bul. 337 (1938), pp. 16, figs. 11*).—Based on a partial resurvey (E. S. R., 67, p. 687), it was found that the shelterbelts, now 14 yr. of age and exposed to a period of severe climatic conditions, had suffered serious losses but that certain species had withstood the trials much better than others. Available soil moisture was the most important limiting factor in survival. The four most successful species—green ash, boxelder, American elm, and caragana—showed an average of 45 percent or more of survival, with the green ash and boxelder approximating 70 percent. Green ash is recommended as the most satisfactory species of all tested. The tops of boxelder, willow, and, to some extent, American elm, were killed back during the severe drought. The evergreens showed a significantly lower survival on heavy clay soils than on lighter soils of a sandy nature. A total of 8 of the 64 shelterbelts examined were in need of light thinning, although none was seriously overcrowded. Two important causes of poor growth were grazing and a lack of adequate culture and care. In some cases tenant operation was a factor in the poorer results. In some localities rabbits caused considerable damage, especially to Scotch pine and Chinese elm by girdling the trunks and killing the lower branches.

Statistics of forest products in the Rocky Mountain States, R. V. Reynolds and A. H. Pierson (*U. S. Dept. Agr., Statis. Bul. 64 (1938), pp. 29, fig. 1*).—Data are presented on lumber production, distribution, consumption, and prices.

Forest products statistics of the Pacific Coast States, R. V. Reynolds and A. H. Pierson (*U. S. Dept. Agr., Statis. Bul. 65 (1938), pp. 30, figs. 4*).—Data are presented on lumber production, distribution, consumption, and prices.

Stumpage and log prices for the calendar year 1937, compiled by H. B. Steer (*U. S. Dept. Agr., Statis. Bul. 66 (1939), pp. 61, figs. 3*).—Data are presented in the usual tabular form (E. S. R., 78, p. 491).

DISEASES OF PLANTS

Handbook of plant diseases, VI, founded by P. Sorauer (*Handbuch der Pflanzenkrankheiten. Berlin: Paul Parey, 1939, vol. 6, pt. 1, pp. XII+647, figs. 63*).—This part of the monograph series (edited by O. Appel, with the collaboration of H. Braun, W. Fischer, G. Hilgendorff, H. Klinger, [H.] Morstatt, E. Riehm, H. Thiem, W. Tomaszewski, W. Trappmann, and A. Winkelmann) covers the agricultural significance of plant protection; and the problems of plant protection, including the prevention of the appearance of plant diseases and pests (e. g., hygiene and quarantine) and their control by physical and chemical means.

[Abstracts of papers presented at the twenty-first annual meeting of the Pacific division of The American Phytopathological Society, 1937] (*Phytopathology, 27 (1937), No. 9, pp. 953–956*).—Abstracts of the following papers are given: Control of Peach Mosaic in Colorado (p. 954) and The Maynard Plum—A Carrier of the Peach Mosaic (p. 954), both by E. W. Bodine; Peach-Mosaic Host-Relationship Studies in Southern California, by L. C. Cochran and L. M. Hutchins (p. 954); History of *Elsinoë fawcetti*, the Causal Fungus of Citrus Scab [Including Synonymy], by A. E. Jenkins and A. A. Bitancourt (pp. 954, 955); A Vascular Rhizoctonosis of Sugar Beet (p. 955) and A *Phytophthora* [*capsici*?] Rot of Cucumber Fruit (p. 955), both by W. A. Kreutzer; A Tomato Resistant to Two Wilts [*Verticillium alboatrum* and *Fusarium lycopersici*], by M. Shapovalov and J. M. Lesley (p. 955); Black Ring, A Virosis of Cabbage and Other Crucifers, by C. M. Tompkins, M. W. Gardner, and H. R. Thomas (pp. 955, 956); and The Infestation of Soil With *Ophiobolus graminis* and Its Subsequent Increase and Spread in the Soil (p. 956) and Effect of Climatic Conditions on the Prevalence of *Ophiobolus graminis* in the Soil (p. 956), both by H. Fellows.

Abstracts of papers presented at the 1938 meetings of the Genetics Society of America (*Genetics, 24 (1939), No. 1, pp. 72, 73, 78, 89*).—The following papers of interest to plant pathology are included: Behavior of Tobacco Mosaic Virus Irradiated With X-Rays of Different Wave Lengths, by J. W. Gowen, and Micro-evolution of Host-Parasite Interactions in Bacterial Wilt of Maize, by R. E. Lincoln and E. W. Lindstrom (both Iowa State Col.); and Fasciation—Its Characteristics, Distribution, Origin, Hereditability, Relation to Environment, and Plant World Analogy to Cancer, by O. E. White.

[Plant disease studies] (*Va. Acad. Sci. Proc., 1938, pp. 40, 41, 43, 45*).—Abstracts of the following papers are included: Influence of Temperature on the Development of the Tobacco Downy Mildew Disease, by R. G. Henderson (Va. Expt. Sta.); Effect of Four Years of Barberry Eradication on Stem Rust of Cereals in Virginia, by G. E. Matheny (U. S. D. A.); A *Fusarium* Disease of Spinach, by H. T. Cook and T. V. Nugent (Va. Truck Sta.); and Methods of Sterilizing Plantbed Soil, by R. G. Henderson, and An Improved Technique for Demonstrating Rust Hyphae and Haustoria in Unsectioned Leaf Tissue, by M. McBryde (both Va. Expt. Sta.).

The Plant Disease Reporter, March 1 and 15, 1939 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 23 (1939), Nos. 4, pp. 55–77, figs. 4; 5, pp. 79–88, fig. 1*).—The following items are included:

No. 4.—*Cephalosporium* wilt of persimmon in the Southeast, by B. S. Crandall; spread of white pine blister rust in 1938 (with map and tabulated detail); *Fusicladium robiniae* and *Macrosporium* sp. in forest tree nurseries (with tabulated data), by W. C. Davis and R. W. Davidson; diseases of fruits and vegetables (apples, celery, grapes, olives, onions, oranges, peas, pears, peppers, pomegranates, squash, tangerines, and tomatoes) on the New York market during the months of October, November, and December, 1938, by J. S. Wiant and C. O. Bratley; symptoms of bacterial wilt and rot (bacterial ring rot) of potato (E. S. R., 80, p. 500); smutty wheat receipts continue decline, by B. W. Whitlock; smutty wheat trends downward on the Minneapolis market, by R. J. Haskell; six-year study shows when to expect freeze losses in winter wheat; brief notes on *Sclerotinia* stem blight on stocks in California, wheat rusts in Kansas, and cereal diseases in California; and new diseases or new distribution reported in the literature (discovery of citrus canker in New Zealand, a bacterial disease of stocks in New South Wales, and *Phytophthora* disease of hops in New Zealand).

No. 5.—Incidence and importance of quince rust (*Gymnosporangium clavipes*) on apple as affected by environmental and developmental factors, by P. R. Miller; tobacco downy mildew situation in Florida, by W. B. Tisdale and R. R. Kincaid; possible cause (*Curvularia lunata?*) of black kernels in rice, by A. L. Martin; adverse weather brings most loss to wheat crop; diseases of shade and ornamental trees—summary of specimens received in 1938 at the New Haven (Conn.) office, division of forest pathology, by A. M. Waterman; and brief notes on losses from corn ear rots in Illinois, *Thielaviopsis basicola* on geranium in Connecticut, and tobacco downy mildew in North Carolina.

[**Plant disease studies by the Iowa Station**]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1938, pts. 1, pp. 103–109, 112, 113, 114, 115, 116, 117, 118, 146; 2, pp. 28, 29, 46–48, 52–59*).—In part 1, brief reports are included on breeding and selection of better disease-resistant strains of watermelons, by G. Younkin and I. E. Melhus; parasitism of smuts, rusts, and minor diseases of oats, by H. C. Murphy; development of disease-resistant strains of oats, by Murphy and L. C. Burnett; control of seed- and soil-borne diseases of potatoes, by C. S. Reddy; pathogenicity, host response, and control of *Cercospora* leaf spot of sugar beets, by C. M. Nagel; development and testing of dust fungicides for controlling seed-borne diseases of wheat and oats, by Reddy; propagation of disease-free sweetpotato seed stock, by Melhus; seedling structure of wilt-resistant watermelons and the inheritance of fruit shape and flesh color by J. N. Martin; yellow dwarf and other onion diseases in Iowa, by G. N. Davis and Melhus; three apple diseases in Iowa, viz, cedar apple rust, apple scab, and root necrosis, by Melhus; plant pathology phases of barley breeding especially for scab resistance, by Reddy; influence of pythiaceous and other fungi on seedling stands of legumes and other crops, by Melhus, Reddy, and W. F. Buchholtz; breeding of sugar beets for disease resistance, by Melhus, Reddy, Buchholtz, and Nagel; identification and control of diseases of small ornamentals and fruit tree stocks in Iowa nurseries, by Melhus; diseases causing poor stands of flax in Iowa and their control, by Reddy; and control of white pine blister rust in Iowa, by G. B. MacDonald, C. J. Drake, and Melhus.

In part 2, brief reports are included on the development of laboratory technics for detecting seed-borne plant pathogens, by R. H. Porter; genetic investigations of bacterial wilt resistance in corn, by E. W. Lindstrom; physiological response

of the growing plant and the pathogen to chemical treatments of seed corn, by Reddy; fermentation products formed by the action of certain fungi on the byproducts of the corn plant, by J. C. Gilman, W. E. Loomis, and C. H. Werkman; factors influencing resistance of strains of corn to *Ustilago zeae*, by Melhus and Davis; *Diplodia zeae* dry rot of corn, by Melhus; pathogenicity of *Basisporium gallarum* to corn, by Reddy; measuring and combining disease resistance in corn, by Melhus; disease resistance (*Diplodia*) in corn—nature and methods of measuring, by Davis, Reddy, Melhus, Loomis, Lindstrom, and A. A. Bryan; and plant disease survey of Iowa, by Melhus, Reddy, Porter, and Davis.

[Plant diseases in Maine] (*Maine Sta. Bul. 391 (1938), pp. 238–241, 258, 259, 288–304, 322, fig. 1*).—Reports of progress are given on studies relating to apple scab control, by D. Folsom; strength of mercuric chloride solutions in treating seed potatoes, by E. R. Tobey and B. E. Plummer, Jr.; Green Mountain potato seed plats, and strain test with special reference to diseases, both by Folsom; spraying and dusting potatoes, including comparison of spray fungicides, the potato dump heap as a source of rust or late blight infection, and elimination of spraying by new [*Phytophthora*] rust-resistant varieties of potatoes, by R. Bonde; studies on the control of *Rhizoctonia*, including comparison of fall and spring as the time for seed treatment, soil infection, and the effect of applying chemicals to the soil in its control, by Bonde and L. Schaal; spread of virus diseases in 1937 in Aroostook County, by Bonde; and insects in the transmission of potato virus diseases, including the relation of roguing, and tests with the pink and green potato aphid and the peach aphid showing the effectiveness of the latter in the spread of leaf roll, by G. W. Simpson. An abstract of the following paper not previously abstracted is also included: Winter injury to ornamental woody plants in Maine (E. S. R., 78, p. 56), by M. T. Hilborn.

Net necrosis of the potato, D. Folsom, W. C. Libby, G. W. Simpson, and O. L. Wyman (*Maine Agr. Col. Ext. Bul. 246 (1938), pp. 12, figs. 9*).—A handbook on this tuber disease, due to the leafroll virus, and its control.

[Phytopathology at the Cornell Station] (*[New York] Cornell Sta. Rpt. 1938, pp. 115, 128–131, 131–134, 135*).—Reports of progress on investigations of the following subjects are included: The Dutch elm disease and its insect vectors and control, by P. A. Readio and D. L. Collins; scab, rhizoctoniosis, and pitting of potatoes, by F. M. Blodgett, C. F. Taylor, E. K. Cowan, and C. S. Tuthill; potato rotation in relation to diseases, by Blodgett, Tuthill, K. B. Nash, and E. N. McCubbin; apple mosaic or variegation, by Blodgett; permanent crop improvement with potatoes through the control of disease by developing immune or disease-resistant stocks, and effect of internal conditions of the potato plant in their relation to susceptibility to *Phytophthora infestans*, both by D. Reddick and W. R. Mills; virus diseases of potatoes, by V. L. Frampton, E. D. Hansing, and T. C. Watkins; biochemical and biophysical studies on the fire-blight fungus, by Frampton; control of onion mildew and of smut, both by A. G. Newhall; lime-sulfur and substitute fungicides for controlling apple scab in western New York, by W. D. Mills; cork, drought spot, dieback, and rosette of apple, and field testing of fungicides for apple scab control, both by A. B. Burrell and F. H. Lewis; strains of *Erwinia amylovora*, cause of fire blight, little-known and imperfectly understood stone fruit diseases (mosaics), and fire blight of apples, pears, and quinces, all by E. M. Hildebrand; a general study of the Dutch elm disease, by D. S. Welch, K. G. Parker, L. J. Tyler, S. Pope, W. L. White, Readio, and Collins; diseases of narcissus and other flowering bulbs, by F. A. Haasis and F. Weiss (coop. U. S. D. A.); and life-history and taxonomic studies on *Typhula* spp., especially those causing snow scald of cereals and grasses in the United States, by Whetzel, H. M. Fitzpatrick, and R. E. Remsberg.

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Plant disease studies (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. 135–144*).—Reports of progress are made on airplane spore-trap studies indicating that wheat leaf rust may come from the North, tests of dusting methods for wheat bunt control, and heat treatments proving effective in saving nursery trees from root knot, all by K. S. Chester; and gravity grading of delinted cottonseed promising better stands of cotton (E. S. R., 80, p. 355), by Chester and G. Tennyson.

[Plant disease studies by the Oregon Station] (*Oregon Sta. Circ. 130 (1938), pp. 4, 15, 27, 30, 31, figs. 12*).—Brief outlines of progress are given on studies of nursery diseases, including *Coryneum* blight of Berckman's and related oriental arborvitae and black mold and storage dieback (*Botrytis*) of roses; onion mildew control by copper oxide or malachite green; downy and powdery wildews, mosaic, and wilt of peas; and root nematode control, particularly with reference to potatoes and clover, which are reduced in yield and quality by this pest.

[Plant disease studies by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 367 (1938), pp. 31, 32, 33, 34, fig. 1*).—Brief outlines of progress are included on sprays for control of scab and codling moth on apples, by H. W. Thurston and H. N. Worthley; fire-blight-resistant pears, by E. L. Nixon; barberry eradication for control of black rust of oats, by F. D. Kern; control of fungus diseases of mushrooms, by W. S. Beach; potato breeding for quality, yield, and disease resistance, by Nixon; culture method of identifying fungi of wood decay; method of determining adhesiveness of insecticide-fungicide sprays, by D. E. H. Frear and H. J. Miller; and factors influencing tobacco wildfire, transmission by flea beetles, and control by sprays, by W. S. Beach.

[Plant disease studies by the South Carolina Station] (*South Carolina Sta. Rpt. 1938, pp. 54–61, 63, 129–131, 186–188, figs. 2*).—Reports of progress are included on studies of *Fusarium vasinfectum* wilt of cotton, by G. M. Armstrong and R. Weindling; the effect of mineral nutrition on the wilt resistance of a resistant and a susceptible cotton variety, by W. B. Albert, W. B. Keller, and Armstrong; cottonseed treatment, by C. H. Arndt; a plant disease survey; tobacco downy mildew (blue mold) treatments, by W. M. Lunn and J. R. Mattison; and control of downy mildew of cucumbers and cantaloups by fungicidal dust treatments, by C. J. Nusbaum.

[Phytopathology at the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1937, pp. 22, 23, 84–86, 93, 94, 95–107, 107–115, 115–121, 175, 193–196, 206, 209, 210, 243, 244, 281–284, 293, 294, 301, 302, 303*).—Reports of progress are given by various Texas Station workers (including G. E. Altstatt, I. M. Atkins, D. C. Bain, G. T. Boyd, L. E. Brooks, A. L. Burkett, W. N. Ezekiel, G. S. Fraps, J. F. Fudge, G. H. Godfrey, A. L. Harrison, S. S. Ivanoff, M. J. Janes, D. T. Killough, E. W. Lyle, C. H. McDowell, E. S. McFadden, G. T. McNess, P. Macy, P. C. Mangelsdorf, H. F. Morris, C. H. Rogers, J. N. Roney, J. J. Taubenhaus, K. W. Wang, G. M. Watkins, R. H. Wyche, and P. A. Young) on studies of root rot; breeding small grains resistant to rust; cotton root rot in Texas in 1937, conditions affecting its local prevalence, life history studies of the fungus (*Phymatotrichum omnivorum*), and some Basidiomycetes found associated with it; studies on the basis of immunity in monocotyledonous plants to *Phymatotrichum* root rot; variation and dissociation within the root-rot fungus; growth of *P. omnivorum* on decoctions prepared from roots of various woody plants; cytology of *P. omnivorum* and of the host parasite relations in field infections by it; strand formation in *P. omnivorum*; growth of *P. omnivorum* in soils to which various amounts of crude petroleum had been added; barriers to prevent spread of root rot; relation of soil acidity to cotton root rot; regional cotton variety *Fusarium* wilt study at College Station and at Jacksonville; effect of foliage dusts and sprays on the yield

and control of foliage diseases of cotton; tomato disease studies (including seed carriers of *Fusarium* wilt, viability of *F. lycopersici* in the dead dry host, the population of Fusaria in wilt-infected soil, varietal tests for wilt resistance, isolation of *F. lycopersici* from wilted plants from different parts of Texas, control of damping-off by seed treatments, control of post-emergence damping-off, the cost of an electrically heated hotbed and coldframe, wind injury of tomato seedlings, a method of disinfecting and preserving hotbed frames, control of soil-borne fungus diseases by chemicals, effect of various sprays for controlling foliage diseases, and virus diseases of tomato in southwest Texas); control of *Heterodera marioni* in vegetable crops; viability of sclerotia of *Sclerotium rolfsii;* rose diseases (including overwintering of fungi associated with dieback, life history studies on dieback, dieback inoculations, field control of dieback and of black spot, effect of fungicides on spore germination of the black spot fungus—*Diplocarpon rosae,* viability of black spot fungus spores, studies on spreader materials for rose fungicides, the effect of weathering on the toxicity of copper sprays to *Actinonema rosae* spores, leaf streak disease—probably virus induced, preparations for histological work on rose diseases, an unidentified cane disease, and *Gloeosporium* black canker); garlic diseases (including their prevalence, 1936–37, the effect of a "mosaic" condition of the leaves, the effect of weevil infestation, the effect of bacterial and fungus rots on the seed pieces—cloves—and the control of these organisms, and variety studies in relation to disease resistance); rice diseases (including organisms associated with discoloration of the kernels); the toxicity of fungicides (including the effect of fungicidal dusts and of sulfuric acid on the germination of spores of various plant pathogens, the effect of aging on the toxicity of Cuprocide and other fungicidal dusts, the effect of various fungicidal chemicals on the growth of damping-off organisms in pure culture, and sulfuric acid treatment for various periods of time as affecting the survival of *Bacterium* (=*Phytomonas*) *malvacearum* and other organisms in cottonseeds); control of damping-off of seedlings (including the effect of chemical seed and soil treatments on damping-off and other diseases, the effect of various seed treatments on the viability of cottonseed and their relation to seedling diseases, chemical seed treatment aiding fall production of bush beans, and seed treatment for carrot, beet, pea, and turnip seeds); miscellaneous disease studies (including the control of strawberry chlorosis, sulfur in controlling potato scab, stinking smut of wheat in Baylor County, sorghum root and crown rot, and the effect of foliage dusts on yield of peanuts); and a list of some 63 plant diseases not previously reported in Texas. Work on rose diseases at the Tyler Substation included field control of black spot and dieback, streak disease, *Gloeosporium* cane canker, and an unidentified cane disease. Cotton root rot investigations at the Temple Substation included the effects of 4-yr. rotations of cotton, oats, sorghum, and corn, of different 2-yr. rotations, of clean fallow and continuous cotton following clean fallow, and of continuous sorghum on number and viability of *Phymatotrichum omnivorum* sclerotia, the effect of 7 yr. clean fallow on root rot and yield of cotton, the effect of continuous sorghum on root rot, the residual effect of different chemicals and previous crop on cotton yield and on root rot, the effect of copper, iron, and mercury on the growth of the root rot fungus in solution cultures, analysis of cottonseed from green plants and from plants killed by root rot at different dates, resistance tests of cowpeas and cotton, and brief notes on miscellaneous crop plant diseases. Wheat diseases at the Denton Substation are noted, including stem rust, bunt, and loose smut. Attempts to control soil-borne tomato pathogens at the Nacogdoches Substation are reported. Studies at the Weslaco

Substation are reported relative to citrus disease control, including gummosis and wood rot, chlorosis, and fruit rots and blemishes; dill leaf and stem blight (second report in America); *Macrosporium carotae* leaf blight of carrot; *Pucciniopsis caricae* leaf blight of papaya; cotton root rot and seedling diseases; control of *Sclerotium rolfsii* on Dutch iris; *Basidiophora entospora* downy mildew of aster; sweet pea mildew control; and root knot nematode control and the susceptibility of *Trigonella foenum-graecum* to it. Root rot studies at the Iowa Park Substation are reported relative to sorghum as a root rot remover, cotton from X-rayed seed in the attempt to obtain resistant selections, and the comparative resistance of grape stocks. Studies at the Winter Haven Substation are reported relative to a general survey of plant diseases in the Winter Garden area, and the control of eggplant yellows, apparently due to a virus and insect-transmitted.

Virus diseases and viruses, P. P. LAIDLAW (*Cambridge, Eng.: Univ. Press, 1938, pp. 52*).—This is a lecture summarizing the present status of bacteriophages, and of the viruses of both plant and animal disease.

Properties of virus proteins, W. M. STANLEY and H. S. LORING (In *Cold Spring Harbor Symposia on Quantitative Biology, VI. Cold Spring Harbor, N. Y.: Biol. Lab., 1938, vol. 6, pp. 341–360, figs. 9*).—This is a critical analytical review (63 literature references) including the work of the authors.

Inhibition of virus activity by insect juices, L. M. BLACK (*Phytopathology, 29 (1939), No. 4, pp. 321–337, figs. 6*).—Juices of the insect vectors *Aceratagallia sanguinolenta, Aedes aegypti, Aphis rumicis, Eutettix tenellus, Macrosiphum pisi, M. solanifolii, Macrosteles divisus*, and *Myzus persicae* were found to inhibit the infectivity of tobacco mosaic virus for Early Golden Cluster beans. Juices of macerated clover leafhoppers (*Aceratagallia sanguinolenta*) inhibited the infectivity of plant juices containing the viruses of potato yellow dwarf, tobacco mosaic, potato X, turnip mosaic, tobacco necrosis, or tobacco ring spot No. 1 when insect juice-virus mixtures were inoculated to suitable test plants. The infectivity of certain mixtures of tobacco mosaic virus and clover leafhopper juice could be increased by dilution or by heat treatment. The inhibitor in clover leafhopper juice proved to be thermolabile, not readily dialyzable, and unstable in acid or alkaline solution. If the inhibitor is a protein, as seems probable, it is very active, since 0.15 mg. of clover leafhoppers, containing only about 0.0015 mg. of soluble protein nitrogen, reduced the infectivity of 1 cc. of a solution of tobacco mosaic virus by 50 percent. A given concentration of inhibitor in the presence of different concentrations of tobacco mosaic virus reduced the number of primary lesions in beans by approximately a constant percentage. Tobacco mosaic virus was not destroyed by the inhibitor in clover leafhopper juice. The virus and the inhibitor were separated by subjecting mixtures of the two either to ultrafiltration or to ultracentrifugation.

Some Fungi Imperfecti from the Pacific Northwest, R. SPRAGUE and W. B. COOKE. (Oreg. Expt. Sta. and U. S. D. A.). (*Mycologia, 31 (1939), No. 1, pp. 43–52, figs. 2*).—Includes new taxonomy in the genera *Naemosphaeria, Placosphaeria, Robillarda, Heteropatella, Septoria*, and *Macrosporium*.

The genus Cordyceps in central Pennsylvania, L. O. OVERHOLTS. (Pa. Expt. Sta.). (*Pa. Acad. Sci. Proc., 12 (1938), pp. 68–74, figs. 9*).—The six species known for the State are described and figured, with local notes.

Growth and metabolism of Fusarium lini, A. K. ANDERSON (*Pennsylvania Sta. Bul. 367 (1938), p. 8*).—The growth-stimulating effect of the carcinogenic hydrocarbon 1,2,5,6-dibenzanthracene on *F. lini* is briefly referred to.

Isolation of Phytophthora spp., L. J. KLOTZ and H. S. FAWCETT. (Calif. Citrus Expt. Sta.). (*Phytopathology, 29 (1939), No. 3, pp. 290, 291*).—*P. citro-*

phthora or *P. parasitica* were easily isolated from contaminations on citrus by thorough washing of infected material, supporting it on hardware cloth at the top of a glass container and allowing it to set in but not completely covered by running water for three or more days, thus enabling the fungus to grow and develop sporangia. The material is then removed, freshly picked tree-ripe or silver-stage lemons are placed on or near the specimens, and the swarm spores are induced to form by replacing the tap water with water at 15° C. Lemons thus infected by zoospores are allowed to decay, and the desired *Phytophthora* sp. is recovered by transferring the seeds aseptically to agar media.

Forced ejection of ascospores from apothecia of Sclerotinia species, L. D. Leach and W. B. Hewitt. (Univ. Calif.) (*Phytopathology, 29 (1939), No. 4, p. 373*).—Ascospores of *S. sclerotiorum* and a brown rot form were forcibly ejected when apothecia were exposed to the vapors over alcohol-formalin-acetic acid-fixing solution. The method is recommended for trial when an abundance of ascospores is wanted.

Contribution to knowledge of the genus Taphrina in North America, W. W. Ray. (Cornell Univ.). (*Mycologia, 31 (1939), No. 1, pp. 56–75, figs. 23*).—Species on *Alnus* and on *Prunus* were studied and four new species are described.

New hosts for the aecidial stage of Uromyces graminis (Niessl) Diet., B. d'Oliveira (*Bol. Soc. Broteriana, 2. ser., 13 (1938), pp. 81–89, pls. 2*).—The author claims to have established the relationship of *Aecidium foeniculi* (=*A. umbelliferarum*) to *U. graminis* on *Melica ciliata* and the heterothallism of the fungus. Sporidia were successfully inoculated into 15 species of 12 umbelliferous genera.

Powdery mildews of peach and rose, C. E. Yarwood. (Univ. Calif.). (*Phytopathology, 29 (1939), No. 3, pp. 282–284, fig. 1*).—*Sphaerotheca pannosa* forms on peach and on rose proved to be morphologically distinct in their conidial stages, and each was found to overwinter in infected buds. Conidia from peach mildew made considerable growth on rose leaves, but no growth of rose mildew on peach leaves was noted. Peach mildew was more luxuriant on leaf curl-infected than on noncurled leaves of ornamental peaches.

Control of powdery mildews with a water spray, C. E. Yarwood. (Univ. Calif.). (*Phytopathology, 29 (1939), No. 3, pp. 288–290*).—Control tests with water at a pressure of 70 lb. and applied late in the afternoon to combat the powdery mildews of euonymus, rose, bean, cucumber, and barley resulted in a marked reduction as compared with comparable unsprayed controls. On the roses, which were also infested with red spider, 1 percent of the treated leaves remained infested with this pest as compared with 13 percent on the controls.

Colchicine in the prevention, inhibition, and death of plant tumors, N. A. Brown. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 3, pp. 221–231, figs. 2*).—Using different methods of applying colchicine, tumor formation was successfully prevented in only a few cases. However, brushing the surfaces of bacterial tumors once with a colchicine-lanolin mixture proved effective for inhibiting further growth and in time killing them. Of the total of 305 tumors, 239 died after such treatment, but none of the 49 tomato tumors included in this number succumbed. Other parts remained normal throughout the life span of the plants. Similar treatment of indoleacetic acid tumors with 2 percent colchicine solution inhibited further growth though failing to kill the tumors, but stronger solutions have not yet been tested.

Relation of particle size and color to fungicidal and protective value of cuprous oxides, J. W. Heuberger and J. G. Horsfall. (N. Y. State Expt. Sta. et al.). (*Phytopathology, 29 (1939), No. 4, pp. 303–321, fig. 1*).—Using a

technic described for the rapid measurement of particle size of cuprous oxide suspensions, a series of powders ranging in color from red with particle size 2.57μ and wavelength 6,440 a. u. through orange to yellow with particle size 0.94μ and wavelength 5,950 a. u. was assembled. The fungicidal value (ability to inhibit spore germination) was tested in the laboratory with spores of *Macrosporium sarcinaeforme* and the protective value (ability to prevent infection) in the greenhouse and field by the usual seed and foliage technic against *Pythium ultimum*, *Diplocarpon rosae*, and *Alternaria solani*. As the particle size and wavelength of reflected light decreased, the fungicidal and protective values were found to increase. As the color is a function of particle size it thus becomes possible to forecast the probable field performance of cuprous oxides from their color. The probable explanation for the increased fungicidal and protective values of cuprous oxides of small particle size appears to be that the area of chemically reactive surface per unit of weight and the rate at which soluble copper is presented to the germinating spore are increased. It is deemed noteworthy that the field and greenhouse results paralleled those of the laboratory tests.

Black ring, a virus disease of cabbage and other crucifers, C. M. Tompkins, M. W. Gardner, and H. R. Thomas. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 12*, *pp. 929–943*, *figs. 6*).—Under study since 1932 (see p. 47), this virus disease is said to occur chiefly in the cool, coastal valleys of California during winter but to be uncommon in summer, and to cause marked injury to the older, outer leaves. Chlorotic lesions, many of them becoming partially or entirely necrotic with age, are characteristic, and the symptoms are most conspicuous on the lower leaf surface. Under glass the virus was transmitted to healthy cabbage by the cabbage and green peach aphids, and it was also readily transmitted by juice inoculations with powdered carborundum. The virus was inactivated between 57° and 59° C., withstood aging in vitro at 22° for 48 hr., and tolerated dilution at 1–700. All cabbage varieties tested were susceptible. Among the Cruciferae, systemic infection was obtained on kale, Brussels sprouts, sprouting broccoli, kohlrabi, turnip, pe-tsai, charlock, dames violet, cauliflower, rape, rutabaga, leaf or Chinese mustard, white mustard, *Brassica adpressa*, shepherds-purse, wallflower, Brompton stock, water cress, Chinese radish, evening scented stock, annual stock, and honesty. Infection was also obtained on plants of 11 other families, viz, rhubarb, lambsquarters, sowbane, spinach, chickweed, mignonette, fibrous-rooted begonia, garden verbena, petunia, Iceland poppy, *Nicotiana glutinosa*, *N. langsdorffii*, *N. tabacum*, mourning bride, annual marguerite, zinnia, winter Cape-marigold, cineraria, and forget-me-not.

The effect of some soil factors on Penicillium injury of corn seedlings, S. Diachun. (Ky. Expt. Sta.). (*Phytopathology*, *29* (*1939*), *No. 3*, *pp. 231–241*).—Wounded corn kernels inoculated by immersion in a spore suspension of *P. oxalicum* and planted with the wound pressed into contact with very wet soil were less injured by the fungus than when similarly inoculated kernels were planted in loose wet or dry soil. *P. notatum* and an unnamed species from a diseased ear in the field offered wounded kernels partial protection against infection by *P. oxalicum* from the soil, though no antagonism among these species and *P. oxalicum* was noted in culture. A substance toxic to corn seedlings was produced on Richard's solution and on autoclaved and living kernels by *P. oxalicum* but not by the other two Penicillia.

1938 sweet corn wilt tests (*New Jersey Stas. Plant Disease Notes*, *16* (*1938*), *No. 8*, *pp. 25–29*).—Tests were conducted at five points in New Jersey. At Moorestown, where wilt was severe enough to give reliable data on resistance,

among 13 varieties Whipcross P39, Whipcross C6.2, Golden Cross Bantam, Bancross P39, and Charlevoix C2 gave the best yields and the first three proved to be very resistant to wilt (*Aplanobacter stewarti=Phytomonas stewartii*). Seneca Golden was extremely susceptible and gave the poorest yield. A summary of the performance of 45 varieties and strains planted at New Brunswick, as to wilt, smut, yield, etc., showed that Early Bancross P39, Whipcross P39, and Golden Cross Bantam again stood at the top rank. Among the very early types, Marcross 13-6, as in 1937, proved to be highly resistant.

Relation of soil moisture to Fusarium wilt of cotton, W. H. Tharp and V. H. Young. (U. S. D. A. and Ark. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 1, pp. 47–61, figs. 4*).—The effect of relative soil-moisture content on this cotton disease was studied under glass, using the susceptible Harper Mebane variety in all tests except one where the resistant Rhyne Cook was used. The soil was a silt loam, high in available nitrogen and phosphate but low in available potash, with a pH of 6.52 and a water-holding capacity of 37.7 percent of the oven-dry weight, and was from a field previously showing severe wilt and potash hunger. Soil moistures at 20–100 percent saturation were used in the tests—three at prevailing greenhouse temperatures (records shown) and one each at constantly maintained soil temperatures of 23°, 26°, 29°, and 32° C.

In all cases the susceptible variety exhibited a positive disease correlation with rise in moisture to an optimum at 80–90 percent saturation and a negative correlation with increase to 100 percent. For the resistant variety there was but little correlation of actually wilted plants with the soil-moisture level. Total-infection measurements indicated an irregular disease increase with rise in soil moisture over the entire range employed. The pH value of the inoculated soil at the different moisture levels became readjusted, until at the end of two experiments it exhibited a positive correlation with the soil-moisture content. In both cases the moisture level producing the highest disease had caused but little readjustment from the original pH 6.52.

"The data obtained at the four constant soil temperatures indicate the possibility of an interrelated influence of soil moisture and soil temperature on the disease. The correlative change in acidity with increase in soil moisture indicates that there may be other interrelated effects of different phases of the disease environment."

The occurrence of the perfect stage of Rhizoctonia solani in platings of diseased cotton seedlings, A. J. Ullstrup. (U. S. D. A. and S. C. Expt. Sta.). (*Phytopathology, 29* (*1939*), *No. 4, pp. 373, 374, fig. 1*).—Basidia, sterigmata, and basidiospores identified as those of *Corticium vagum* developed in platings with mycelium of *R. solani* from diseased cotton seedlings. The complete life cycle was obtained only when multispore transfers were used to seed plates of tap-water agar.

Purification of Nicotiana virus 6 protein, H. H. Thornberry and H. H. McKinney. (U. S. D. A.). (*Phytopathology, 29* (*1939*), *No. 3, pp. 250–260, fig. 1*).—*Nicotiana* virus 6 (causing mild dark green mosaic of tobacco) was purified from crude plant juice by crystallization at pH 4.5 and 0.3 saturation of $(NH_4)_2SO_4$. The infectivity of the diseased plant juice was associated with a protein resistant to tryptic digestion. Analysis of the dialyzed protein indicated 13.28 percent N, no P, and 0.16 percent S, while nondialyzed protein contained 11.9 percent N, 0.33 percent P, and 1.33 percent S. Under dark field the unit crystals of protein were elliptical particles measuring 0.3μ–0.5μ×0.3μ–1.6μ, while unit crystals of *Nicotiana* virus 1 protein were needlelike, 0.4μ–0.5μ×3.2μ–4.2μ. Both virus proteins on standing aggregated into threads or bundles of

unit crystals. *Nicotiana* virus 6 protein was dispersed at pH 7.5 to the degree of no visible particles and precipitated at pH 4.5 into elliptical crystals. At intermediate pH values the size and number of precipitated particles were directly proportional to the acidity. At pH 7.5 and in the presence of trypsin the protein was precipitated into typical crystals.

Ergot of Paspalum, C. L. LEFEBVRE. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 4, pp. 365–367*).—Observations and artificial inoculations (2 yr.) indicated that several *Paspalum* species not previously reported as hosts of *Claviceps paspali* are susceptible to the parasite, the following apparently being new hosts: *P. urvillei, P. longipilum, P. pubescens, P. pubiflorum, P. ciliatifolium, P. langei, and P. intermedium.* On the other hand, the following species of this grass genus were repeatedly but unsuccessfully inoculated in the field: *P. notatum* (narrow-leaf type from Paraguay, and common local type from Georgia), *P. lividum, P. malacophyllum* (strains from Tifton, Ga., and Gainesville, Fla.), and *P. supinum.*

The Mycosphaerella disease of winter peas, and diseases of winter peas and vetches caused by Ascochyta species, J. L. SEAL (*Alabama Sta. Rpt. 1937, pp. 24, 25*).—This is a progress report on studies of these diseases and their control.

Verticillium wilt of pepper, Capsicum annuum, W. C. SNYDER and B. A. RUDOLPH. (Univ. Calif.). (*Phytopathology, 29 (1939), No. 4, pp. 359–362, fig. 1*).—A fungus wilt of pepper having been recently reported from California and Connecticut (E. S. R., 78, p. 491) in association with a *Verticillium,* the authors tested the pathogenicity of the California isolate, demonstrating clearly the susceptibility of *C. annuum* to this pathogen, identified as *V. alboatrum.* Tomatoes grown in pots following infected peppers developed no aerial symptoms after 4 mo., but the fungus was recovered from a number of the side rootlets. It is suggested that possibly *Verticillium* rather than *Fusarium* may have been the cause of some of the vascular mycosis of peppers formerly attributed to the latter fungus.

[Potato diseases in Colorado] L. W. DURRELL and C. H. METZGER (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 1, pp. 3, 7, 8, 13, 14, figs. 2*).—A note, with description of symptoms, is given by Durrell (pp. 3, 7, 8) on the new wilt and tuber rot related to the German "ring rot" and said to have been prevalent over a large number of Colorado potato fields during the 1938 season. The disease is tuber-borne, and all varieties are said to be susceptible. A sharp lookout for cases and the utmost care in "seed" selection are advised. An article by Metzger (pp. 3, 13, 14) discusses the 1938 season and its effect as regards the seed situation in 1939.

The infection of potato roots by Heterodera schachtii, A. R. GEMMELL (*Phytopathology, 29 (1939), No. 3, pp. 287, 288*).—The nematode larvae are said to be very easily detected in potato roots stained in 2 percent alcoholic iodine followed by destaining in alcohol to clear. Using this method on root tips of the same length (hence of about the same age), it was shown that, with other conditions comparable, the crop yield is directly related to the percentage of root tips infected at the early growth stages.

A study of suberin and suberized deposits of diseased potato tubers, L. M. HILL. (W. Va. Expt. Sta.). (*Phytopathology, 29 (1939), No. 3, pp. 274–282, figs. 4*).—The author presents methods for determining the difference between suberin and suberized deposit in lesions of potato tubers affected with several diseases. The petrographical microscope was used along with various microchemical tests to determine the presence of suberin and cellulose in the cell walls. The suberin was anisotropic in normal and wound periderm and in

corky cells surrounding the necrotic areas. The suberized deposit was isotropic and laid down on, or perhaps infiltrated in, a cellulose matrix and the result of oxidation and condensation of cell sap drying on the cellulose walls of cells associated with wound periderm and with necrosis in the tuber. The suberized deposit was studied in blue stem, purple-top wilt, net necrosis, hollow heart, stem-end browning, and in potato tissue invaded by *Fusarium avenaceum*. In all these cases this deposit had the same chemical and physical properties. Cutin was not associated with necrosis in the diseased potato tubers. Only a small amount of suberized deposit was associated with hollow heart as compared to that with wound cork. The cork cambium formed in hollow heart was spongy, while that of normal periderm was not. The suberized deposit always masked the anisotropic properties of starch, cellulose, and suberin. Phenol was associated with the suberized deposit, but was absent in suberin and in cellulose walls. Suberin and cutin are length-fast and cellulose is length-slow. Optical properties distinguishing cutin, suberin, suberized deposits, and cellulose proved useful in studying the necrotic lesions.

A mosaic disease of radish in California, C. M. TOMPKINS. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 2, pp. 119–130, figs. 5*).—The symptoms of a mosaic disease of radish in the San Francisco Bay section California, are described as consisting at first of irregular-shaped, chlorotic lesions later developing into a coarse mottle, while on older plants the normal, dark green tissue appears as irregularly shaped, nonraised islands on a yellowish-green chlorotic background. Mechanically, the virus was readily transmissible with an incubation period of 9–18 days, but greenhouse attempts to transmit it by cabbage, green peach, or turnip aphids failed. The virus was infective after 14 days at 22° C., was inactivated by heating for 10 min. at 68°, but caused infection at 1:14,000 dilution. It is compared with certain other crucifer viruses. The host range was found to include 20 species of 9 genera in 4 families. In the Cruciferae, infection was obtained on *Brassica pe-tsai*, kale, Brussels sprouts, cabbage, sprouting broccoli, cauliflower, kohlrabi, black and white mustard, evening scented stock, Virginian stock, turnip, Chinese mustard, Chinese radish, and weeds, but annual stock proved resistant. Other susceptible hosts included lambsquarters, sowbane, spinach, rocket larkspur, *Nicotiana glutinosa*, *N. langsdorffii*, *N. rustica humulis*, and Turkish and White Burley tobacco. No infection was obtained by mechanical inoculation in 51 species of 44 genera in 25 families.

Variation in Sphacelotheca sorghi (Link) Clinton, L. J. TYLER (*Minnesota Sta. Tech. Bul. 133* (*1938*), *pp. 48, figs. 10*).—Germinating chlamydospores of the covered smut fungus of sorghums are described and illustrated. The associated cytological phenomena indicate a far greater variability and more deviation from normal type than hitherto supposed. Essentially, the life cycle was like that of several species of *Ustilago*. Using sporidial fusions and the Bauch test for determining sex in *S. sorghi*, evidence was obtained that the sexual compatibility of paired lines may be determined soon after inoculation. Segregation for sex factors was apparently complete in the first or second nuclear divisions of the germinating spore. Two sex groups were found, and the sex factors segregated in the 2:2 and 1:3 ratios. Some data indicated that there are more than two sexual compatibility groups. Four ratios of factor segregation for cultural characters (independent of segregation for sex characters) were found, viz, 2:2, 4:0, 3:1, and 2:1:1. Artificially cultured, *S. sorghi* comprises an indefinite number of cultural types differing in one or more cultural characters, which are discussed in detail. Nutrients appeared to affect the rate of sectoring, malt agar and plain sugar media plus nutrient salts ap-

pearing to induce sectoring. Some lines sectored abundantly, others only rarely. For more than a year 14 lines remained culturally constant when grown on potato-dextrose agar, but 8 of them produced one or more sectors of new cultural type when later grown on malt agar. Lines arising through intraspecific hybridization between monosporidial lines from different chlamydospores differed in pathogenicity as indicated by stunting, color of peridia, size and hardness of smut balls, size of chlamydospores, and length of time required for chlamydospore germination. A bibliography of 47 entries is included.

Curly-top-resistant sugar-beet varieties in 1938, F. V. Owen, F. A. Abegg, A. M. Murphy, B. Tolman, C. Price, F. G. Larmer, and E. Carsner. (Coop. Calif., Utah, and Idaho Expt. Stas.). (*U. S. Dept. Agr. Circ. 513 (1939), pp. 10, figs. 2*).—Use of resistant varieties is said to have removed much of the danger formerly threatening the destruction of the sugar-beet industry in parts of California, Colorado, Idaho, and Utah. The history of curly-top-resistant varieties is briefly reviewed. Since none of the previous varieties met the differing requirements of all localities where curly top is an important factor, the present work was undertaken to provide another step towards the goal of better regional adaptation of resistant strains. Selection of very resistant individuals from U. S. 1 has given rise to a number of resistant strains, and U. S. 12 was thus originated by mass selection. Under severe test conditions U. S. 12 yielded 10.52 tons per acre as compared with 7.09 tons for U. S. 33 and 1.6 tons for R. & G. Old Type. The bolting tendency in U. S. 33 and U. S. 12 is said to be too strong to permit fall and winter planting in California, while in U. S. 14 it is low. The curly top resistance of the last is about as in U. S. 1, but it is susceptible to downy mildew. These varieties are described, and other superior strains being developed are discussed. Growing of seed in mild climates by the overwintering-in-the-field method is said to be unsatisfactory with varieties low in bolting tendency and in all varieties it results in deterioration, but the method may be used in cold climates to produce stock seed and low-bolting varieties.

Studies on a cultural variant of Rhizoctonia solani, E. L. LeClerg. (U. S. D. A. and Minn. Expt. Sta.). (*Phytopathology, 29 (1939), No. 3, pp. 267–274, figs. 3*).—Comparison of a sector variant occurring in a sugar-beet isolate of *R. solani* with the parent culture indicated that hyphal diameters of the two cultures did not differ significantly. The parent culture grew faster on potato dextrose, dextrose, and methylene-blue media, but much slower on media high, medium, or low in nitrogen. The parent also grew faster on media containing 0, 1, and 5 percent sucrose, but at 10 and 20 percent sucrose the growth rate of the variant was more rapid. The radial growth of parent was greater than that of variant at 15°, 23°–25°, and 29°–30° C. The parent culture was more aggressive in causing root rot of large sugar-beet roots, while the variant caused more damping-off of sugar beets at 15° and 25°.

Downy mildew of tobacco in Brazil, F. A. Wolf (*Phytopathology, 29 (1939), No. 3, p. 291*).—The author reports *Peronospora tabacina* from Brazil, and refers to an early collection of *P. nicotianae* in Argentina.

Contribution to the knowledge of tobacco mosaic and its wild hosts in Brazil [trans. title], K. Silberschmidt and M. Kramer (*Arq. Inst. Biol. [São Paulo], 9 (1938), pp. 1–20, pls. 4; Ger. abs., pp. 17, 18*).—The viruses from eight tobacco plants showing various stages of a disease of mosaic type, collected in the State of São Paulo and tested by inoculations, all proved to be true tobacco mosaic strains, differing only in relative virulence. On this basis the eight strains fell into three groups. The susceptibility of a series of wild Solanaceae, frequent as weeds in the vicinity of tobacco and potato fields, was tested by inoculation with tobacco mosaic virus, the following proving to be easily infected: *Solanum*

reflexum, *S. platanifolium*, *S. aculeatissimum*, *S. mammosum*, *S. atropurpureum*, *S. sisymbriifolium*, and *S. nigrum*. The symptoms on these hosts are described and in part illustrated. *S. variabile* appeared to act as a carrier without itself exhibiting definite symptoms. The significance of the weeding out of wild solanaceous hosts for reduction in the incidence of mosaic in tobacco fields is discussed.

Virus protein of mosaic disease of tobacco, C. G. VINSON, D. K. MCREYNOLDS, and N. S. GINGRICH (*Missouri Sta. Res. Bul. 297 (1939), pp. 12, figs. 3*).—The authors found that the virus readily separated in the crystallinelike form of Stanley when anhydrous solid Na_2SO_4 was added to the virus fraction after adjustment to pH 4. Most of the ash could be removed from this crystallinelike material by washing with dilute acetic acid. The N content was ±16 percent, and P was present. All visible traces of the brown pigment normal to tobacco-plant juice could be removed from the purified fraction by shaking a phosphate dispersion with ether, the pigment being carried to the top as the droplets of ether rose. X-ray diffraction patterns (camera and procedure described) of this virus protein prepared by the Na_2SO_4 method were obtained, but they failed to agree very well with those obtained by Wyckoff and Corey (E. S. R., 78, p. 585) who used virus protein prepared by the $(NH_4)_2SO_4$ method of Stanley. There was no indication on any film of spacings greater than 14.3A, although spacings as great as ±50A could have been detected. Wyckoff and Corey recorded six spacings greater than 14.3A. Spacings as low as 2.43A were obtained, in contrast to the smallest spacing of 3.39A recorded by Wyckoff and Corey. The absence of long spacings in virus protein prepared by the Na_2SO_4 method may indicate it to be composed of smaller molecules, and hence with a lower molecular weight than that studied by others. There are 19 literature references.

The effect of flue-curing on the infectivity of ordinary tobacco mosaic virus (tobacco virus 1), J. A. PINCKARD and L. BOZOVAISKY. (Va. Expt. Sta.). (*Phytopathology, 29 (1939), No. 3, pp. 242–250, figs. 2*).—Tobacco virus 1 remained infective in flue-cured tobacco leaves throughout four of the first five barns cured and in the lower and middle tiers of the fifth (1937). Although it was completely inactivated in the lower tiers of seven barns of cured tobacco, the final drying temperatures were higher than ordinarily required for curing. In other parts of the same barns, maximum temperatures were both above and below the thermal limit of the virus. Temperature differences amounting to as much as 50° F. were found within the same wood-fired barn. In five barns of tobacco cured with an oil-burning heating unit at no time was the thermal death point of the virus reached. Leaves infected with tobacco virus 1 lost weight and cure and became dry at the same temperature and time as did noninfected leaves. The temperatures required for a satisfactory "cure" varied, but were substantially below the thermal death point and time for complete inactivation.

Controlling damping-off of tomato seedlings with light, and chemicals on seed and soil, P. A. YOUNG. (Tex. Expt. Sta.). (*Amer. Jour. Bot., 25 (1938), No. 10, p. 18s*).—An abstract.

The tipblight disease of tomato, F. P. MCWHORTER and J. A. MILBRATH (*Oregon Sta. Circ. 128 (1938), pp. 14, figs. 4*).—The name "tipblight" is given to a virus disease typically developed in the tomato-canning counties of southern Oregon where yields have frequently been very seriously reduced. The results of the 4-yr. study here summarized include a description of the disease, its history and distribution, infectiousness, means of spread, and certain facts about the causal virus considered necessary for discussing control methods. Tipblight may be found in Rogue River Valley fields late in June, but it does not become abundant until July and August. The amount present and its dissemination are said to be directly influenced by the abundance of its insect

carriers (shown to be species of thrips) and the availability of the weed hosts of the carriers. The virus is said to be difficult to transmit by artificial inoculation, is unable to resist aging, high temperatures, or dilution in water, and is apparently not seed-borne. The possibility of weeds serving as virus reservoirs was experimentally demonstrated, though actual overwintering under field conditions has not yet been proved. Various indirect methods of control are outlined, and some progress is reported in the isolation and development of resistant strains of tomato.

Tomato tip-blight virus, J. A. Milbrath. (Oreg. Expt. Sta.). (*Phytopathology, 29 (1939), No. 2, pp. 156–168, figs. 4*).—This virus is described as new, and some of its physical properties are described. The thermal death point lay at 40°–41.5° C., the "longevity" in vitro was less than an hour, and the dilution end point was less than 1–50. The virus was transmitted by *Thrips tabaci*, but mechanical transfer proved difficult. The symptoms of tipblight on various differential hosts are described, and methods of identifying the virus are discussed.

Tripsacum dactyloides, another native host of Aplanobacter stewarti, C. Elliott and A. L. Robert. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 3, pp. 284, 285*).—Lesions induced by *A. stewarti* (=*Phytomonas stewartii*) developed spontaneously on *T. dactyloides* at Arlington Experiment Farm, Va., grown from seed collected at Bellville, Tex., in 1936. The somatic cells contained the diploid number of 36 chromosomes characterizing the Texas form of this grass.

The 1938 wheat leaf-rust epiphytotic in Oklahoma, K. S. Chester. (Okla. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1939, Sup. 112, pp. 18, figs. 2*).—From the analysis here presented of the weather record, development of infection by *Puccinia rubigo-vera tritici*, varietal susceptibility, and other factors influencing the 1938 crop, "it is concluded that the leaf rust was the major reason for the 25 to 30 percent reduction in yield and quality of the 1938 wheat crop in Oklahoma. This conclusion is consistent with the findings of various cereal disease specialists who have studied the crop in the Southwest, and with the estimates of losses from leaf rust as the disease followed the crop northward from Texas to the Dakotas and Canada."

Boron deficiency as related to pimply measles, internal cork, and similar apple diseases (*New Jersey Stas. Plant Disease Notes, 16 (1938), No. 7, pp. 21–24*).—A review of recent work in North America without references.

Stony pit, a transmissible disease of pears, J. R. Kienholz. (U. S. D. A. and Oreg. Expt. Sta.). (*Phytopathology, 29 (1939), No. 3, pp. 260–267, figs. 2*).—This is a preliminary report of studies begun in 1934 showing stony pit of pears to be due to a virus. Its symptoms consist of a fruit pitting, a so-called "oak-bark" effect, and probably a veinlet chlorosis of certain leaves. The trouble is known on the Bosc and occasionally on the Anjou varieties in California, Oregon, and Washington. It was transmitted to healthy Bosc and Anjou trees by budding from diseased Bosc trees, in most cases the symptoms appearing during the second season. Bartlett pears proved to be either tolerant or immune by the same method.

Brown-rot sclerotinias occurring in California and their distribution on stone fruits, W. B. Hewitt and L. D. Leach. (Calif. Expt. Sta.). (*Phytopathology, 29 (1939), No. 4, pp. 337–351, figs. 4*).—A discussion of earlier studies relative to the species causing brown rot of stone fruits in California is presented, showing that *Sclerotinia laxa* has long been present and probably has been responsible for most of the brown rot therein described. *S. fructicola* may have been introduced relatively recently, causing the severe fruit rotting. Apothecia,

shown to be those of *S. fructicola*, were found in California on March 3, 1936, apparently for the first time, and have since been found in a number of peach orchards in the Sacramento Valley region. *S. laxa* was isolated subsequently from diseased apricot twigs, and the identity of each species was determined by comparisons in culture, spore measurements, pathogenicity studies, and by comparison with published descriptions. In a brown rot survey of the principal stone-fruit districts of California *S. laxa* was found throughout the districts from which specimens were obtained, whereas *S. fructicola* was more localized, occurring most abundantly in the Sacramento Valley. *S. fructicola* was isolated most frequently from brown-rot-diseased fruits, whereas *S. laxa* was isolated more frequently from blighted blossoms and twigs. In no instance was *S. fructicola* isolated from over-wintered blighted twigs of stone fruits that were producing sporodochia, all isolations from these twigs yielding *S. laxa*. The latter was the only organism isolated from brown-rot-affected flowers and twigs of almonds collected during this survey.

The "X" or "yellow-red virosis" disease of peaches (*New Jersey Stas. Plant Disease Notes, 16 (1938), No. 9, pp. 30–33*).—A descriptive review based on recent literature.

Virus diseases of the genus Prunus in Bulgaria, A. Christoff (*Phytopath. Ztschr., 11 (1938), No. 4, pp. 360–422, pls. 11*).—This is a critical review of the literature (61 references), with a summary of the author's studies on virus diseases of stone fruits in Bulgaria.

Currant mosaic, E. M. Hildebrand. (Cornell Univ.). (*Phytopathology, 29 (1939), No. 4, pp. 369–371, fig. 1*).—This preliminary report describes a new virus characterized by chlorotic patterns on the leaves of red currants (*Ribes rubrum*) found in the Hudson River Valley. The more advanced stages are marked by stunting and by decline in vigor and fruitfulness, resulting in dieback and final death of diseased plants. Transmission was effected by grafting, but the suspected insect vector has not yet been found.

Diseases of strawberry, S. M. Zeller (*Oregon Sta. Bul. 357 (1938), pp. 23–30, figs. 7*).—This is a brief presentation of important facts regarding diseases of this crop due to viruses (crinkle, yellows, and witches' broom), fungi (*Mycosphaerella fragariae* leaf spot, leaf scorch, leaf blight, mildew, *Armillaria* crown rot, and root and fruit rots), nematode gall, and alkali yellows.

Symptomatology of deficiencies and toxicities of citrus, A. F. Camp. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc., 51 (1938), pp. 145–150*).—This paper presents the leaf, fruit, and growth symptoms, distributions, and general discussions of zinc deficiency or frenching, copper deficiency or dieback and ammoniation (exanthema of Fawcett), magnesium deficiency or bronzing, manganese deficiency, and boron toxicity.

Limitations of the bark-scraping method in the control of gummosis and psorosis of citrus, A. S. Rhoads. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc., 51 (1938), pp. 114–127*).—This is a further progress report on tests of this method begun in 1927 and recently reported (E. S. R., 78, p. 69). Bark scraping is said to have proved effective in most cases for psorosis on orange trees and for both gummosis and psorosis on grapefruit trees, if done thoroughly and in the early stages. Aside from the basal form (foot rot), gummosis seems not to occur on orange trees in Florida but is widespread on both grapefruit and lemon trees, the latter being very susceptible and generally affected after attaining a few years of age. Psorosis is said to be much the more serious disease in Florida.

Spraying and pruning for melanose control, W. A. Kuntz and G. D. Ruehle. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc., 51 (1938), pp. 89–*

102).—As a result of a 4-yr. study of melanose control by spraying with copper fungicides and by pruning, it is concluded that as a disease of commercial citrus varieties under Florida conditions melanose cannot be entirely eliminated since the causal *Phomopsis* is always present and produces varying damage from season to season. Although cold injury, "cropping strain," and severe scale infestations have not been thoroughly studied, these three strongly modifying factors should be avoided as far as possible to assist in better melanose control. Since they are largely responsible for dead wood in the trees, there are times and seasons when pruning is essential for the regaining of normal vigor and to aid in lessening the abundance of the melanose fungus. With bright fruit the sole objective, spraying should be emphasized, but it is believed that combined pruning and spraying will produce the best results from the standpoints of both the trees and the production of bright fruit.

Pitting and decay in pineapple oranges, [C. O. BRATLEY] and J. R. WINSTON. (U. S. D. A.). (*Citrus Indus., 20 (1939), No. 1, pp. 6, 7, 17, 20, 21, figs. 4*).—Preliminary results of tests to determine the effects of various packing house practices and of different transit temperatures on the condition of fruit on arrival at the market seem to indicate that the beneficial effects of low transit temperatures on control of decay lasts throughout a marketing period of one week, but even so the loss, particularly from blue mold (*Penicillium*) rot, in all lots was excessive. Fruits from each of the five cooperating Florida growers were considerably pitted on arrival at New York, and after 7 days were severely pitted. In these tests it was clear that the amount of pitting was greatly increased by packing house operations and particularly by the "color added" treatment, and it is deemed imperative that each step in handling the fruit be examined so that injury may be kept at a minimum.

Control of black rot of pineapples in transit, C. O. BRATLEY and A. S. MASON (*U. S. Dept. Agr. Circ. 511 (1939), pp. 12, fig. 1*).—In 14 holding tests in Puerto Rico and 7 shipping trials between Puerto Rico and New York City, alcoholic solutions of benzoic acid proved the most effective of several materials tried for controlling *Thielaviopsis paradoxa* infection of Red Spanish pine-applied to the cut surface of the stem within 2 hr. after harvesting—and without acid in 100 cc. of 30-percent alcohol gave as good control as higher strengths when applied to the cut surface of the stem within 2 hr. after harvesting—and without injury to the fruit. About one-fifth of the decay started at packing bruises on the side of the fruit. The correct diameter and weight of fruits for each packing size were determined and are listed, and it was found that proper sizing prevented much of the bruising.

Geographical distribution of yellow spot of pineapples, W. CARTER. (Hawaii. Pineapple Producers' Expt. Sta.). (*Phytopathology, 29 (1939), No. 3, pp. 285–287, fig. 1*).—The author reports the finding of typical yellow spot of pineapples in the Bathurst area of South Africa. The fruit symptoms were most common, suggesting the vector of this virus in that area to be primarily a flower feeder, possibly *Frankliniella schultzei*. No yellow spot was found on the Island of Mindanao, P. I., either in pineapples or *Emilia*, although the latter plant was generally distributed.

Delphinium diseases, P. P. PIRONE. (Cornell Univ.) (*Delphinium [Amer. Delphinium Soc.], 1937, pp. 49–51, figs. 3*).—Brief notes on crown rot (*Sclerotium delphinii*), mildew (*Erysiphe polygoni*), and leaf spot (*Phytomonas delphinii*), including control measures.

Powdery mildew of Delphinium, E. B. MAINS (*Delphinium [Amer. Delphinium Soc.], 1937, pp. 51–53, figs. 2*).—A brief note on this disease, including the results of inoculation tests on *Delphinium* spp. and other hosts as suggesting

the fungus to be limited to the former genus and to be present in more than one race. Resistant strains of the host are considered to be the best means of control.

A new menace to gardenias—bacterial leaf spot, P. P. PIRONE. (N. J. Expt. Stas.). (*Florists Exch. and Hort. Trade World, 92 (1939), No. 6, p. 18, fig. 1*).—Preliminary results here briefly noted indicate the new leaf spot to be bacterial in origin and to present a serious menace to the growing of gardenias under glass.

Two mosaic diseases of annual stock, C. M. TOMPKINS. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 1, pp. 63–77, figs. 7*).—Virus-induced mild mosaic and severe mosaic of *Matthiola incana* are described. These diseases prevail in the cool coastal valleys of California and cause considerable loss in the cut-flower and seed crops. Leaf mottling and flower breaking are the principal symptoms of both but are more conspicuous in the severe form. These viruses were readily transmissible by carborundum inoculations with juice. Spontaneous transmission is by the turnip or false cabbage aphid (*Lipaphis pseudobrassicae*), which breeds on annual stock. Seed transmission tests were negative. All self-colored varieties proved highly susceptible, but only the mottling symptom occurred on white- and yellow-flowered varieties. Hosts susceptible to both forms of virus include turnip, black mustard, white mustard, dames violet, evening scented stock, charlock, shepherds-purse, mignonette, and Turkish and White Burley tobaccos. Failure to infect cabbage, cauliflower, kale, brussels sprouts, sprouting broccoli, kohlrabi, rape, and rutabaga serves to differentiate these two annual stock mosaic viruses from certain other crucifer viruses, while differential hosts are also one means of differentiating the two mosaics themselves. Susceptible to infection with the mild mosaic virus only are Chinese or leaf mustard, pe-tsai, radish, Chinese radish, Virginia stock, honesty, sweet alyssum, wallflower, *Brassica adpressa*, sowbane or nettle-leaf goosefoot, *Nicotiana glutinosa*, and *N. langsdorffii*. Infection of lambsquarters, spinach, and petunia was obtained only with the severe mosaic virus. Studies on the properties of these viruses indicated the mild mosaic form to remain infectious for five days after storage at 22° C. and the severe form for seven days. Both were inactivated at 58°–60°. The mild mosaic virus infected up to 1:4,000 and the severe mosaic virus up to 1:3,000 dilution. Flower breaking of annual stock may also be induced by the mosaic viruses of Chinese cabbage, turnip, horseradish, and cabbage and also by the cabbage black-ring virus.

Bordeaux injury on walnut quality, B. A. RUDOLPH. (Calif. Expt. Sta.). (*Pacific Rural Press, 137 (1939), No. 8, p. 182*).—This is a general account including local observations.

Avenues of entrance for canker-forming Nectrias of New England hardwoods, T. J. GRANT and P. SPAULDING. (U. S. D. A. et al.). (*Phytopathology, 29 (1939), No. 4, pp. 351–358, fig. 1*).—From observations and measurements of more than 3,000 *Nectria* cankers on various hardwood species (birch, maple, aspen, oak, hickory, and pin cherry) in several New England forests, together with two series of inoculations close to the axils of branches, it was indicated that branches on hardwoods and especially the small young branches, buds, and short spurs on birches often serve as avenues of entry for the canker fungus. However, branches over 0.5 in. in diameter do not serve as avenues of entrance for Nectrias into larger branches or trunks unless infection occurs at or very close to their axils. Inoculations and field observations indicated that infection usually occurs through living or dying branches rather than through completely dead branch stubs. The size of the branch attacked, the time of year that injury occurs, and the host reactions are

important factors in canker development. In general, small stems were more readily girdled than large ones, and fall and winter injuries appeared to be more important than those occurring in late spring or early summer, when prompt activity of the cork cambium may aid in checking early stages of invasion by the fungus.

The canker of Cupressus induced by Coryneum cardinale n. sp., W. W. Wagener. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 1, pp. 1–46, figs. 10*).—This disease—characterized by resinous lesions in the bark of twigs, branches, and trunks, resulting in ultimate girdling—was discovered in California in 1927 (E. S. R., 59, p. 646) and has since become one of the important tree diseases of the region. The principal hosts are *Cupressus macrocarpa* and *C. sempervirens stricta*, but isolated infections have been found on *C. pygmaea*, *C. forbesii*, *C. lusitanica*, *Thuja orientalis*, *Chamaecyparis lawsoniana*, *Libocedrus decurrens*, *Juniperus chinensis femina*, and *J. sabina tamariscifolia* (?). In California the disease is epidemic on planted cypresses, with an estimated loss to date of 30,000 trees, but it has not yet been found in the restricted native groves of *Cupressus*. It has also been reported from New Zealand. Trees of any size or age may be attacked by it.

Coryneum cardinale n. sp. is fully described and shown to be the cause. An unnamed saprophytic *Coryneum* with nearly identical spores also occurs on *Cupressus macrocarpa*, and the two are differentiated. Exposure of the parasitic species to low temperatures slightly depressed subsequent growth at favorable temperatures. Extension of the cankers in length averaged ±20 cm. per year at an inland station and ±10 cm. at a cool, coastal station. Spore production in nature is governed chiefly by humidity. In dry storage spores remained viable as long as 42 mo. Dissemination is said to be chiefly by natural means, but also to occur through infected plant materials and locally on pruning tools. Coated slides and plates exposed to wind yielded but few spores, but as high as 228 per square centimeter were caught on filter paper under cankers during rains. In the field infection may evidently occur with or without wounds, but experimental infections without wounding were inconclusive. Inoculations demonstrated susceptibility to be pronounced for *C. macrocarpa*, moderately high for *C. sempervirens indica* and *J. virginiana*, medium for *C. lusitanica*, *C. arizonica*, and *C. macnabiana*, and slight or absent for *T. occidentalis*, *J. occidentalis*, *Cryptoméria japonica*, and *L. decurrens*. The disease was probably established in California as early as 1915, but proof of its origin is lacking. The importance of preventing establishment of the fungus in new districts is stressed. A bibliography of 44 titles is included.

The cause of pecky cypress, W. A. Murrill. (Fla. Expt. Sta.). (*Bul. Torrey Bot. Club., 66 (1939), No. 2, pp. 87–92, figs. 6*).—"Pecky cypress," now used for antiques and interior finishing, is said to be due to *Fomes geotropus*. The occurrence of the fungus fruiting brackets appears to be rare, and a case of such development on an affected specimen of common baldcypress (*Taxodium distichum*) is described and fully illustrated. The fungus was found on box-elder and magnolia, and herbarium specimens of infected sweet gum, linden, red bay, and winged elm are also noted.

"Cephalosporium die-back" of elms, F. A. McCormick. (Conn. [New Haven] Expt. Sta.). (*Phytopathology, 29 (1939), No. 4, pp. 371, 372*).—Two elm trees (New Haven, Conn.) are reported to have been infected with *Dothiorella ulmi* (*Cephalosporium* sp.) and under observation for 11 yr. During this time repeated cultures have produced the same fungus, although the trees are said to be in fully as good condition as when infection with this supposedly virulent

fungus form was first noted. Observations and inoculations suggest the probability that the particular fungus strain involved is low in virulence.

Damping off as a factor in the natural distribution of pine species, S. A. Wilde and D. P. White. (Univ. Wis.). (*Phytopathology, 29 (1939), No. 4, pp. 367–369, fig. 1*).—Coinciding closely with present empirical knowledge of the relative resistance of pines to damping-off, greenhouse tests with samples of representative soils from the arboretum area (near Madison, Wis.) resulted in almost complete loss of red pine (*Pinus resinosa*) seedlings on heavy mull soils, less damage to white pine (*P. strobus*), and no infection on Austrian pine (*P. nigra*). These results suggest that a prominent role is played by the damping-off fungi prevalent on these soils of calcareous origin in limiting the distribution of certain pines. In the light of these findings the advisability of extensive plantings of northern conifers on heavy calcareous soils is questioned.

The probable mechanism of the protective action of resin in fire wounds on red pine, A. F. Verrall (*Jour. Forestry, 36 (1938), No. 12, pp. 1231–1233, fig. 1*).—Fire wounds are generally considered as common foci for the entrance of wood-destroying fungi. In Minnesota a large majority of mature red pines (*Pinus resinosa*) were found to be entirely free of decay behind fire wounds, even when the latter included 25 percent of the circumference of the tree and had been present for over 50 yr. This relative lack of decay is believed to be due to the infiltration of resinous materials into the exposed wood. While essentially nontoxic, this infiltrate acts as a waterproofing layer, preventing the penetration of wood-destroying organisms.

Breeding horticultural crops for resistance to the root-knot nematode, K. C. Barrons. (Ala. Expt. Sta.). (*Assoc. South. Agr. Workers Proc., 39 (1938), pp. 106, 107*).—An abstract.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Work in zoology and entomology by the Alabama Station] (*Alabama Sta. Rpt. 1937, pp. 31–34*).—The work of the year briefly referred to (E. S. R., 78, p. 815) includes the vegetable weevil, by J. M. Robinson; life history and control of the cowpea curculio, by F. S. Arant; the control of citrus insects with oil emulsions, the toxicity of derris to white fly larvae and purple scale, and the effect of oils on satsuma trees, all by L. L. English; and fertilizers and plants for farm ponds, by H. S. Swingle, E. V. Smith, and G. D. Scarseth.

[Work in economic zoology and entomology by the Iowa Station]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1938, pts. 1, pp. 134–144, 145; 2, pp. 59–61*).—The work of the year in this field is briefly reported (E. S. R., 79, p. 503). Part 1 takes up the influence of meteorological factors upon honey production and factors involved in the transformation of nectar into honey by the honeybee, both by O. W. Parks; the wheat insect pest survey, biology and control of onion insects (the onion mirid *Labopidea allii* Knight, and the black onion fly *Tritoxa flexa* Weid.), and survey of potato insects, all by C. J. Drake; insecticides and insect toxicology, particularly as relate to the lesser migratory grasshopper *Melanoplus mexicanus mexicanus* Sauss., and the bionomics and control of the codling moth and other apple insects, both by C. H. Richardson; emergency grasshopper investigations, by Drake and Richardson; environmental carrying capacity for wintering bobwhite quail and the ecology of the muskrat, both by P. L. Errington; variation in resistance to American foulbrood in honeybees and supersedure of queens by honeybee colonies, both by Park and F. B. Paddock; the ecology and management of the raccoon (*Procyon*

lotor), by L. J. Bennett and G. O. Hendrickson; and studies with cottontail rabbit (*Sylvilagus floridanus mearnsi*), by Hendrickson.

Part 2 reports on white grub (*Phyllophaga* spp.) investigations, by Drake and E. V. Collins; the bionomics and control of the chinch bug, by Drake, Richardson, and G. C. Decker; and the nutrition and metabolism of insects (largely insects attacking stored grain and foods), by Richardson.

[Work in economic zoology and entomology by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1938, pp. 89, 111–115, 115–118*).—The work of the year referred to (E. S. R., 79, p. 71) included the nutritional requirements of trout, by C. M. McCay and A. V. Tunison; ecological and life history studies on the alfalfa snout beetle, by C. E. Palm, C. G. Lincoln, and W. D. Wylie; white grub and other forage crop insects, by Palm, T. W. Kerr, Jr., and C. P. Zorsch; biology and control of the two common clothes moths and dermestid larvae injurious in dwelling houses, both by G. H. Griswold; wireworms (wheat wireworm and eastern field wireworm) and their injuries to potatoes, by G. F. MacLeod and W. A. Rawlins; the efficiency of spraying and dusting practices in protecting potatoes grown on muck soils, by MacLeod and H. Menusan, Jr.; insects attacking potatoes on Long Island, by MacLeod and J. O. Nottingham; biology and control of onion thrips, by MacLeod and W. H. Ewart; nonpoisonous sprays, by T. R. Hansberry and L. B. Norton; honey, with special referenee to the origin of special ingredients, by E. F. Phillips, E. C. Martin, and W. L. Coggshall; and propagation of natural fish forage and bait and a study of body proportions of trout, both by G. C. Embody.

[Work in economic zoology and entomology by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1937, pp. 57–67, 144–151, 156–159, 175, 176, 206, 207, 256, 265, 271–273, 281, 303, 304.*)—The work of the year reported upon (E. S. R., 79, p. 76) relates to the biology, control and taxonomy of white grubs (*Phyllophaga* spp.) in Texas, by H. J. Reinhard; bollweevil, its control and hibernation, by J. C. Gaines, Reinhard, M. J. James, W. L. Owen, Jr., and R. W. Moreland; cotton flea hopper, its migration or dispersal, abundance, control, and hibernation, by F. L. Thomas, Gaines, K. P. Ewing, Owen, and Reinhard; the flower thrips, by Thomas and Gaines; the pink bollworm, including parasite studies, varietal resistance, cultural control, and remedial measures, by A. J. Chapman; the cotton bollworm, its hibernation and spring emergence and biology, by R. K. Fletcher; sulfur as an insecticide, by S. E. Jones, Thomas, and W. S. McGregor; pecan insect investigations, by S. W. Bilsing; devil's shoestring (*Tephrosia virginiana*) as an insecticide, by V. A. Little, G. A. Russell, and Thomas; southwestern corn borer, by Thomas and McGregor; truck crop insect (Hawaiian beet webworm, corn earworm, turnip aphid, common red spider, northern mole cricket, and southern mole cricket) investigations, by J. N. Roney; apiary inspection, 1936–37, by C. E. Heard and C. J. Burgin; activities of bees and relationship of honey plants to insects, both by H. B. Parks; adaptability of native honey plants (E. S. R., 78, p. 598), queen rearing, breeding for resistance to American foulbrood, and bee production, all by Parks and A. H. Alex; horsemint for honey and oil production, by Parks and V. L. Cory; Walker County, Tex., wildlife resources survey, by D. W. Lay and W. P. Taylor; field studies of bobwhite quail in east Texas, by V. Lehmann, D. H. Reid, H. Hahn, and H. R. Siegler; plant-wildlife relationships, by S. R. Warner and Lay; the gray squirrels and fox squirrels of east Texas, by P. D. Goodrum; ecology of the Attwater prairie chicken, by Lehmann; present status and future needs of vanishing species, by Taylor; at the Tyler Substation insect investigations with thrips, the bollworm, and the peach tree borer, by Owen; at the Temple Substation miscellaneous insect pests, by

C. H. Rogers; at the Chillicothe Substation control of the cotton flea hopper; at the Sonora Substation a study of screwworm and fly repellents, by W. H. Dameron, and insects affecting animals, including goat lice, sheep fly, sheep botfly, and winter tick, the effect of first-instar larvae on the eye of sheep, wetting agents, and larvicides, by O. G. Babcock; at the Weslaco Substation entomological experiments with the citrus mite, pea aphid, tomato fruitworm, scale on citrus, and cottony cushion scale; and at the Winter Haven Substation investigations with the beet leafhopper, corn earworm, cabbageworms (the diamondback moth and cabbage looper), onion thrips, and *Paratrioza cockerelli* (Sulc.), by Janes, and with the California red scale *Aonidiella aurantii* (Mask.), *Anychus clarki* McG., the seed-corn maggot, the blister beetle *Macrobasis albida* (Say), and the spotted cucumber beetle, by E. Mortensen.

Problems of animal ecology, F. S. BODENHEIMER (*Oxford: Univ. Press, 1938, pp. VI+[1]+183, figs. 28*).—This subject is dealt with in connection with a 7-page list of references to the scientific literature of the world.

[Conservation of wildlife] (*Internatl. Assoc. Game, Fish, and Conserv. Commrs. Convs., Proc., 29 (1935), pp. 102, figs. 3; 30 (1936), pp. 114, fig. 1; 31 (1937), pp. 68, figs. 4*).—The proceedings of the conventions of the International Association of Game, Fish, and Conservation Commissioners held in 1935, 1936, and 1937, are presented. A contribution on Research and Game-Management Units in Land Grant Colleges, by W. C. Henderson, is included in the report for 1935 (pp. 87–90).

[Work in game management by the Wisconsin Station] (*Wisconsin Sta. Bul. 442 (1938), pp. 48–51, fig. 1*).—The work of the year referred to (E. S. R., 78, p. 813) relates to quail management, by A. Gastrow and A. Leopold; the nesting of birds in hayfields, by Leopold and A. S. Hawkins; and the type of pheasant that survives the best, by I. O. Buss and Leopold.

A history of Nebraska ornithology, M. H. SWENK (*Nebr. Bird Rev., 1 (1933), No. 2, pp. 50–53; 2 (1934), No. 4, pp. 137–143; 3 (1935), Nos. 2, pp. 69–74; 3, pp. 115–125, fig. 1; 5 (1937), No. 3, pp. 51–57*).—The several parts of this contribution, each of which is accompanied by a bibliography, deal with the subject as follows: (1) The ancient period (pp. 50–53, 137–143), (2) period of the earliest explorations (pp. 69–74), and (3) period of the explorations of the early nineteenth century (1804–1854) (pp. 115–125, 51–57).

The birds of El Salvador, D. R. DICKEY and A. J. VAN ROSSEM (*Field Mus. Nat. Hist. [Chicago] Pub., Zool. Ser., 23 (1938), pp. 609, pls. 24, figs. 29*).—This contribution is based upon several years' field work in the collection of birds in El Salvador. It is presented with an account of each form, including locality of collection, status of occurrence, plumage notes, and other information such as nesting habits, etc., and, in some cases, stomach contents.

Notes on the insect-food of the little owl, A. HIBBERT-WARE (*Roy. Ent. Soc. London, Proc., Ser. A, 12 (1937), No. 4–6, p. 68*).—The notes here presented relate particularly to the European earwig as food of the little owl and a list of Coleoptera identified in the pellets and other food material.

[Work in entomology by the Maine Station] (*Maine Sta. Bul. 391 (1938), pp. 234–238, 241–243, 256, 257, 304, 305, 311–313, figs. 2*).—Included in the work referred to (E. S. R., 79, p. 76) are investigations with pea aphids, their life history, factors which cause their abundance and the relation of fungus disease to such abundance, insect parasites and predators, losses caused, and tests with insecticides, spreaders, and machinery for their control, by J. H. Hawkins; insects affecting the apple crop, particularly the gypsy moth, the apple maggot, the plum curculio, and the apple seed chalcid, by F. H. Lathrop; the Mexican bean beetle and wireworms affecting the potato crop (including the re-

lation of cultural practices to wireworm control and crop rotations for their control), both by Hawkins; and blueberry insects, particularly the blueberry maggot and the blueberry thrips *Frankliniella vaccinii* Morg., by Lathrop.

[Work in entomology by the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. 62, 63, 75–97, 100, figs. 6*).—Following reference to the occurrence of the important insects of the biennium (E. S. R., 77, p. 66) brief reports are made of the absence of ill effects from grazing lambs under sprayed and dusted pecan trees; poison bait and fungus disease control of grasshoppers, by R. R. Walton, F. E. Whitehead, L. G. Duck, and W. W. Ray; the extermination of red harvester ants by the proper use of either carbon bisulfide or calcium cyanogas, by R. G. Dahms; the chinch bug problem, including winter surveys, the finding of a beetle (*Collops quadrimaculatus* F.) to be a very important enemy, and tests to determine the relation of nitrogen and phosphorus fertilizers to chinch bug resistance in sorghums (coop. U. S. D. A.), by Dahms and M. Kagan; control of the wheat white grub by crop rotation, by F. A. Fenton and C. B. Cross; the overwinter survival of the corn earworm, control of the walnut caterpillar on pecans by pruning, spraying, or dusting, the use of high-yielding varieties of cotton in combating the bollweevil, and control of the red-necked cane borer by pruning and by planting resistant varieties, all by E. Hixson; armyworm control by the use of baits and control of the European fruit lecanium with oil spray, both by Fenton; control of housefly nuisance by the chemical treatment of manure, by Fenton and Stricklen; control of the flat-headed apple tree borer by pruning and tree wraps, by Fenton, Johnson, and Bewick; the resistance of bollweevils to relatively low temperatures, by Hixson and C. A. Sooter; a study of the effect of terracing and pond-making on the mosquito problem, by L. E. Rozeboom; and a study (1) in an experimental apiary of the period and rate of nectar flow, (2) of the effectiveness of hexachloroethane against the corn earworm (coop. U. S. D. A.), and (3) of control of the eggplant lace bug by a mixture of superfine dusting sulfur containing 2 percent rotenone, all by G. A. Bieberdorf.

[Research work in economic entomology by the Oregon Station] (*Oregon Sta. Circ. 130 (1938), pp. 5, 10, 11, 15, 18, 21–26, 34, 35, 39, 44, 45, 46, figs. 40*).—Brief accounts are given in this preliminary report as follows: Problems of fur farming in Oregon; nursery insects; rotation control of the flax worm, officially known as the strawberry fruitworm, and other flax pests; the onion maggot; insect pests of hops; control of the filbert moth and other filbert pests, the pea weevil and the pea aphid, and the potato flea beetle; chemical control work with the symphylid enemy of vegetable and flower gardens; and prune thrips control.

[Work in economic zoology and entomology by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 367 (1938), pp. 57–60, fig. 1*).—The work of the year reported upon (E. S. R., 78, p. 511) relates to the timing of sprays for control of the codling moth, by D. E. H. Frear and H. N. Worthley; control of red mite, by Worthley: tomato pinworm, the greenhouse symphilid, wireworms, and mushroom pests, all by C. A. Thomas; the rose leaf beetle, by M. Wood; sod webworms, by H. C. Hallock; and trout food in a Centre County stream, by G. L. Trembley.

[Work in economic entomology by the South Carolina Station] (*South Carolina Sta. Rpt. 1938, pp. 63–73, 114–125, 136–144, 189–194, figs. 13*).—The work of the year briefly reported (E. S. R., 79, p. 360) relates to the tomato fruitworm and a faunal survey, both by F. Sherman; the rice weevil in corn and the oriental fruit moth, both by O. L. Cartwright; corn earworm studies, by Cartwright and J. N. Todd; the Mexican bean beetle and the cowpea curculio, both by Sherman and Todd; and at the Pee Dee Substation bollweevil

and miscellaneous cotton insect investigations, including the testing of substitutes for calcium arsenate, tests of presquare treatments for bollweevil control, randomized plat arrangement for testing calcium arsenate with low, medium, and high water-soluble arsenic content, spring and fall examinations of Spanish moss in 1937–38, and examination of woods trash for hibernating bollweevils, experiments in the hibernation of bollweevils in cages, cotton trap crop for bollweevil emergence, and experiments in control of the cotton root aphid and cotton leaf aphids, by F. F. Bondy and C. F. Rainwater, and experiments with insecticides as a control for the tomato worm and the tobacco flea beetle on tobacco, by N. Allen, J. W. Humphreys, and D. B. Lieux.

Work at the Edisto Substation mentioned includes insect control studies, particularly with the asparagus beetle, bollweevil, and the corn budworm, by J. G. Watts.

[Contributions on economic insects and insecticides] (*East Malling [Kent] Res. Sta. Ann. Rpt., 25 (1937), pp. 203–228, pls. 2, fig. 1*).—The following contributions (E. S. R., 79, p. 217) are presented: Notes on Some Interesting Insects Observed on Fruit Trees in 1937, by A. M. Massee (pp. 203–208); Notes on the Strawberry Aphid (*Capitophorus fragariae* Theob.) (pp. 209–212) and Studies of Impregnated Tree Banding Materials—IV, Apple Blossom Weevil [*Anthonomus pomorum* (L.) Curt.] and Codling Moth Experiments in 1937 (pp. 213–218), both by A. M. Massee, R. M. Greenslade, and A. J. Duarte; Spray Residue Investigations—II, The Influence of Spray Supplements on the Retention of Lead Arsenate on Apples, by H. Shaw and W. Steer (pp. 219–222); and Experiments in the Control of Plum Sawfly [*Hoplocampa flava* L.] on Czar Plums, by W. Steer and A. A. G. Hassan (pp. 223–228).

[Contributions on economic insects and mites] (*Jour. Southeast. Agr. Col., Wye, Kent, No. 42 (1938), pp. 60–63, 66–92, 214, 215, figs. 13*).—The several contributions presented are: Tests of Ovicidal Washes Against *Tetranychus telarius* L. on Hops, by S. G. Jary and M. D. Austin (pp. 60–63); Investigations on the Insect and Allied Pests of Cultivated Mushrooms—XII, Two More Tyroglyphid Mites [*Caloglyphus* sp. ? *berlesei* and *Eberhardia* sp.], by S. G. Jary (pp. 66–81) (E. S. R., 77, p. 815); The Control of Big Bud Mite (*Eriophyes ribis* (Westw.) Nal.), by Lime Sulphur, by S. G. Jary, M. D. Austin, and R. S. Pitcher (pp. 82–92); and Notes on Diplopoda—V, The Recognition of Some Millipedes of Economic Importance, II, by S. W. Rolfe (pp. 214, 215) (E. S. R., 77, p. 815).

Insect and other pests of 1937, A. E. Cameron (*Highland and Agr. Soc. Scot. Trans., 5. ser., 50 (1938), pp. 94–127, figs. 18*).—A summary of information on pests of importance in Scotland in 1937 (E. S. R., 78, p. 815).

Insect pest work (*Empire Cotton Growing Corp., Expt. Stas. Prog. Rpts., 1936–37, pp. 26–41, fig. 1*).—In part 1 of this contribution from the Barberton Experiment Station, Union of South Africa (E. S. R., 79, p. 218) F. S. Parsons, H. Hutchinson, and J. Marshall report on investigations on the American and red bollworms (pp. 26–32) and in part 2 E. O. Pearson reports on investigations on cotton stainers and internal boll disease (pp. 33–41).

Entomological notes (*Agr. Jour. [Fiji], 9 (1938), No. 4, pp. 12–19, pl. 1, fig. 1*).—Accounts of a Javan parasite (*Pleurotropis* sp.) of the coconut leaf miner *Promecotheca nuciferae* Mlk., introduced into New Guinea from Fiji, by R. J. A. W. Lever (pp. 12–14); local fruitflies and their parasites (pp. 14, 15); introduction of the beetle *Hister chinensis* Guen., from Hawaii for the control of houseflies (pp. 15, 18); local insect pests of books and their control (p. 18); and use of sodium silicofluoride as an insecticide (p. 19) are noted.

Insect collections of the world, I–III [trans. title], W. Horn and I. Kahle (*Ent. Beihefte Berlin-Dahlem, 2 (1935), pp. 160+12, pls. 16; 3 (1936), pp. 161–*

296, pls. 10; 4 (1937), pp. 297–536+VI, pls. 12, figs. 2).—The first and main part of this work takes up the nature and location of these collections (pp. 1–388). The arrangement is in alphabetical order under the names of the entomologists, past and present, who have assembled collections of insects of any extent, together with the location of the collections. Additional data are presented in the seven supplementary parts (pp. 389–510).

Dispersal of insects by air currents, E. P. FELT (*N. Y. State Mus. Bul. 274 (1928), pp. 59–129*).—The information presented, based upon a review of the literature and investigations conducted, reveals the fact that winds, especially those of the upper air, are sufficient for the occasional and possibly somewhat general extended movements of insects. There appears to be no indications that such movements are limited to species possessing superior flying ability, since the probabilities are that the purposive flight of an insect, that is, the distance covered by its own efforts, is relatively insignificant. A four-page list of references to the literature is included.

Wind drift and dissemination of insects, E. P. FELT (*Canad. Ent., 70 (1938), No. 11, pp. 221–224*).—Data obtained subsequent to that above noted have tended to confirm rather than weaken the conclusions incident to that study.

Plant breeding and cotton insect pests, F. R. PARNELL (In *Third Conference on Cotton Growing Problems, September 1938—Report and Summary of Proceedings. London: Empire Cotton Growing Corp., 1938, pp. 81–85*).—A practical discussion.

A note on a new method of control for insect pests of the cotton plant, T. G. MASON and E. PHILLIS (*Empire Cotton Growing Rev., 14 (1937), No. 4, pp. 308, 309*).—A discussion of the relative toxicity of selenium to plants and animals and its possible use as an insecticide.

A preliminary annotated list of fruit pests of the North-West Frontier Province, H. S. PRUTHI and H. N. BATRA (*Imp. Council Agr. Res. [India], Misc. Bul. 19 (1938), pp. 18*).—Information is given on some 40 insect pests of fruit and melons under observation in the North-West Frontier Province.

An annotated conspectus of the insects affecting fruit crops in S. India, T. V. RAMAKRISHNA AYYAR (*Madras Agr. Jour., 26 (1938), No. 9, pp. 341–351*).—An annotated conspectus of all the fruit insects so far noted in south India, with brief notes on their economic and bionomic importance and some general suggestions for control.

Two new winter washes for fruit trees, G. L. HEY (*Jour. Min. Agr. [Gt. Brit.], 45 (1938), No. 9, pp. 932–940*).—In the experiments of 1937 and 1938 reported, (1) a synthetic organic thiocyanate wash consisting of β-butoxy-β'-thiocyanodiethylether and (2) 3 to 5 parts of dinitro-o-cresol, both incorporated in petroleum oil, were tested on fruit trees. The former gave a good control of the apple aphid, apple capsid, and the woolly apple aphid when applied to apples in the green tip and delayed dormant stage. It also reduced the caterpillar infestation without causing damage to the trees. The dinitro-o-cresol wash at 7 percent proved an efficient aphid ovicide at five centers, slightly superior to the thiocyanate-oil wash, and in no way inferior to a tar oil wash. At one center it proved slightly inferior to the thiocyanate-oil wash and at another it gave highly variable results against aphid.

Apple insect control studies in 1938 (progress report), H. N. WORTHLEY and H. M. STEINER (*Pennsylvania Sta. Bul. 376 (1939), pp. [2]+13, figs. 2*).—The results of spraying experiments in 1938 for the control of the European red mite, rosy apple aphid, codling moth, and pistol casebearer are presented and discussed, the details being given in six tables. While good aphid control was

obtained with tar oil and certain other toxicants added to dormant petroleum oil sprays, and with nicotine sulfate added to delayed dormant sprays of liquid lime-sulfur or petroleum oil, none of the spray mixtures tested proved satisfactory against winter eggs of European red mite.

In moderate infestations in south-central Pennsylvania orchards where most of the damage in 1938 was caused by second-brood codling moth larvae, lead arsenate continued to give the best control but not without producing harvest residues of lead in excess of the present tolerance of 0.025 gr. per pound. Under these conditions the addition of stickers to lead arsenate in four cover sprays failed to show increased control. A high degree of codling moth control and lessened spray injury was obtained by producing a heavy lead arsenate deposit in the second, the final, cover spray through the employment of an inverted or "dynamite" spray mixture. The omission of lime-sulfur from the cover spray mixture of lead arsenate and lime resulted in a great increase in arsenic injury to the foliage, while the substitution of a so-called insoluble copper (copper phosphate) fungicide for the lime-sulfur seriously interfered with codling moth control.

Preliminary tests of sprays for pistol casebearer control suggest that, while an increase in populations of this insect may be retarded or prevented through the use of lead arsenate in a full schedule of foliage sprays applied with thoroughness, this treatment will not serve to reduce an outbreak. For this purpose best results were secured with two sprays containing 0.75 percent summer oil and nicotine sulfate at the rate of 1 pt. per 100 gal. applied in early July against the eggs and young larvae. These sprays were applied with great care to wet both under and upper sides of the leaves, especially those in the top center of the trees.

Insect pests of strawberry, W. D. Edwards and S. M. Zeller (*Oregon Sta. Bul. 357 (1938), pp. 5–23, figs. 12*).—A practical account of the insect and mite enemies of strawberry in Oregon and means for their control. Those of major importance are spittle bugs, strawberry root weevils (E. S. R., 75, p. 525), the strawberry fruitworm, the strawberry leaf roller and the western strawberry leaf roller *Anacampsis fragariella* Busck., the cyclamen mite, the strawberry crown moth *Synanthedon bibionipennis* Boisd., the strawberry crown miner *Aristotelia fragariae* Busck., and the strawberry aphid.

Insects infesting stored grain and seeds, H. H. Shepard (*Minnesota Sta. Bul. 340 (1939), pp. 30, figs. 11*).—In this bulletin, which replaces Bulletin 198 (E. S. R., 47, p. 453), the subject matter has been largely rewritten and brought up to date where necessary.

A list of granary insects and their associates from Japanese Empire [trans. title], S. Nakayama (*Chosen Govt. Gen. Agr. Expt. Sta. Ann., 10 (1938), No. 2, pp. 153–170, pls. 3; Eng. abs., pp. 166–168*).—A list is given of 64 species of insects and mites and their predators and parasites found in warehouses, etc., in Japan. Of these, 10 species are of primary importance as stored grain pests.

The enemies of hazelnut, chestnut, and pistachio nut trees, P. T. Anagnostopoulos (*Dendrok. Ereuna (Hort. Res.), 3 (1938), No. 3, pp. 497–544, figs. 28*).—The more important pests of these nut trees in Greece are dealt with in this article, of which all except the title is in the Greek language.

A guide to the insects of Dalbergia sissoo for forest officers, C. F. C. Beeson et al. (*Indian Forest Rec., n. ser., Ent., 4 (1938), No. 1, pp. [3]+42, figs. 2*).—This guide deals with insects attacking the living tree (pp. 7–23) and insects attacking the felled tree and timber (pp. 24–35), the arrangement being systematic according to the parts attacked.

A survey of the insect pests of eucalypts in New Zealand, A. F. Clark (*New Zeal. Jour. Sci. and Technol., 19 (1938), No. 12, pp. 750–761, figs. 5*).—Important insect pests of eucalyptus in New Zealand dealt with are *Eriococcus coriaceus* Mask., *Gonipterus scutellatus* Gyll., *Paropsis dilatata* Er., and *Rhicnopeltella eucalypti* Gahan.

Intermediary arthropod hosts and mechanical carriers of human disease in the Australian region, F. H. Taylor (*Health [Austral.], 16 (1938), No. 8, pp. 72–82, fig. 1*).—This is a tabulated summary of information.

The fate of certain European insects introduced into Australia for the control of weeds, G. A. Currie and R. V. Fyfe (*Jour. Council Sci. and Indus. Res. [Austral.], 11 (1938), No. 4, pp. 289–301*).—An account is given from observations of the behavior and fate of phytophagous insects that since 1929 have been imported into Australia from England and France for the control of introduced weeds, St. John's wort and ragwort. The several introduced species released thus far have disappeared after a shorter or longer period, although liberations have been made over a period of years in many different places within the weed-infested areas. "The ease with which some phytophagous insects have been established in new countries, as compared with the difficulty experienced with others, is discussed, and evidence is presented supporting the generalization that, if a phytophagous insect is able to adapt itself and thrive in a new environment, it will probably do so from the early liberations of relatively small numbers."

Notes on entomogenous fungi, T. Petch (*Brit. Mycol. Soc. Trans., 16 (1931), pt. 1, pp. 55–75, figs. 4; 16 (1932), pt. 4, pp. 209–245, figs. 8; 18 (1933), pt. 1, pp. 48–75; 19 (1935), pt. 3, pp. 161–194, figs. 7; 21 (1937), pt. 1–2, pp. 34–67*).—A genus (*Ophiocordyceps*) is erected and many forms are described as new to science in these notes on over 100 insect-attacking fungi.

***Preliminary observations on the gaseous environment of Eutermes exitiosus* Hill (Isoptera),** M. F. Day (*Jour. Council Sci. and Indus. Res. [Austral.], 11 (1938), No. 4, pp. 317–327, figs. 6*).—It was found that a concentration of carbon dioxide approximately 50 times that of the normal atmosphere, while injurious to many animals, is the normal environment of certain termites.

Descriptions of Nearctic caddis flies (Trichoptera), with special reference to the Illinois species, H. H. Ross (*Ill. Nat. Hist. Survey Bul., 21 (1938), Art. 4, pp. III+101–183, pl. 1, figs. 123*).—Many new forms of caddis flies are described and two genera and three subgenera erected for Trichoptera from Illinois and elsewhere.

Qualitative and quantitative changes in radiosensitivity of grasshopper eggs during early development, T. C. Evans (*Physiol. Zool., 9 (1936), No. 4, pp. 443–454, pl. 1, figs. 3*).—The results of experiments in which grasshopper eggs of different ages were irradiated and examined at the time of diapause are reported.

Grasshopper eggs and their larval predators show high degree of survival, J. A. Munro (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 3, pp. 3, 4*).—A brief reference is made to an attempt to determine the effect of drying and prolonged storage at low temperatures on the viability of grasshopper eggs and their larval predators. The results indicated that while dryness seriously impaired the viability of both the eggs and the larval predators it is probable that they are seldom exposed to such severe conditions. The results show that the same factors which affect the development of grasshopper eggs also affect the welfare of their predaceous enemies, the bee fly and blister beetle larvae, and in much the same manner.

Oxygen consumption and rates of dehydration of grasshopper eggs (Orthoptera), V. THOMPSON and J. H. BODINE (*Physiol. Zool., 9 (1936), No. 4, pp. 455–470, figs. 10*).—Determination of the water loss of the differential grasshopper at different developmental periods has shown no qualitative difference between wet (with hypertonic solutions) and dry (calcium chloride) dehydration. "The resistance to desiccation decreases with morphological age of developing eggs. Diapause eggs are most resistant. The rate of desiccation does not seem to be closely associated with metabolic activity, as represented by that fraction of the respiration which is dependent on structure, or which may be depressed by certain CO/O_2 mixtures. The oxygen consumption of dehydrated eggs decreases during water loss. In no case was an increase observed during dehydration. The vital limit of desiccation of postdiapause eggs at 25° C. was found to be about 46 percent of the initial water."

A list of 31 references to the literature is included.

The egg parasite of the plague grasshopper: Value as a factor in control, N. S. NOBLE (*Agr. Gaz. N. S. Wales, 49 (1938), No. 3, pp. 143–146, 156, figs. 7*).—Further observations (E. S. R., 74, p. 825) on the scelionid egg parasite *Scelio fulgidus* made during the grasshopper plague in Australia in 1937–38 are reported. There is said to be no evidence at present to show that this parasite breeds in the eggs of any species other than the plague grasshopper *Chortoicetes terminifera*.

Studies of contact insecticides.—XIII, The blood of the cockroach Periplaneta americana L.: Cell structure and degeneration and cell counts, H. W. SMITH (*New Hampshire Sta. Tech. Bul. 71 (1938), pp. 23, figs. 9*).—In continuation of these studies (E. S. R., 78, p. 75) investigation was made of the blood of the American cockroach. A simple and constant blood cell picture was observed. The various forms described by many authors in other insects not having been found, they are considered to represent in part the results of coagulation-break-down phenomena. "The acetic acid vapor treatment facilitated study of the normal cell structure by its fixative action and was used as a standard procedure. Blood was drawn from the coxofemoral leg joints. The blood cells of the cockroach are elongated and flat with uniform and well-defined outlines. Their size is about 25μ by 10μ. No dividing cells were found. The break-down of cell structure in the process of coagulation causes many abnormal forms. A study of the rounding and disintegration of cells in coagulation has simplified differentiation between normal and abnormal cell structures. The average blood cell count was 88,755 cells per cubic millimeter. Analysis of cell counts, however, showed the principal mode in the frequency of cell count distribution to be the 70,000 group. There was no significant difference in the average counts of males, females, and large nymphs. The total cell count for adult cockroaches was determined as approximately 16,500,000."

A 5-page list of references to the literature is included.

The nutritional requirements of Blattela germanica, C. M. MCCAY (*Physiol. Zool., 11 (1938), No. 1, pp. 89–103, figs. 3*).—Methods devised for the use of the German cockroach in nutrition studies are considered. The conversion of matter into body tissue by this cockroach indicates that it is nearly three times as efficient as domestic animals, such as swine. An extensive series of tests to determine the vitamin needs of this insect indicates that it must have certain essential factors found in yeast.

Nutrition studies with the cockroach Blatella germanica, R. M. MELAMPY and L. A. MAYNARD (*Physiol. Zool., 10 (1937), No. 1, pp. 36–44, fig. 1*).—A report on a nutritional study of the German cockroach, which was selected because of its omnivorous feeding habits, incomplete metamorphosis, fast growth rate, and rapid reproduction.

Report on the Hemiptera-Heteroptera taken in the light trap at Rothamsted Experimental Station during the four years 1933–1936, D. C. Thomas (*Roy. Ent. Soc. London, Proc., Ser. A, 13 (1938), No. 1–3, pp. 19–24, fig. 1*).—Collections in a light trap with a 300-c. p. electric light, set about 3.5 ft. above the level of the ground and kept continuously in use at the Rothamsted Experimental Station from March 1933 to February 1937, are reported upon. The details are given in tables.

Use of sulphur dioxide against the bedbug, H. C. Gough (*Nature* [*London*], *141 (1938), No. 3560, p. 164*).—Using a fumigation apparatus the author exposed different stages of the bedbug for 2.5 hr. to known concentrations of sulfur dioxide under controlled conditions of temperature and humidity. The results, expressed as the amount of this gas required to give a complete kill of each stage at 23° C. and 60 percent relative humidity, are summarized in table form. It appears that the egg, especially just after its deposition, is considerably more resistant than either the adult or any nymphal instar, and that this resistance gradually decreases as the time of hatching approaches.

Lygus hesperus Knight and Lygus elisus Van Duzee in relation to alfalfa-seed production, C. J. Sorenson (*Utah Sta. Bul. 284 (1939), pp. 61, figs. 15*).—Studies of tarnished plant bugs in Millard County and the Uinta Basin, namely, *L. hesperus* and *L. elisus*, are reported, the details being given in 29 tables. These bugs were found to be the most abundant insect inhabitants of alfalfa-seed fields, with the exception of thrips, during the bloom period and to increase significantly the occurrence of blasted buds, blossom drop, and shriveled seed during the production of an alfalfa seed crop. The degree of injury generally varied directly with the intensity of the bug infestation. The observations indicate that while *Lygus* bugs are a major factor in causing bud blasting, shriveled seeds, and perhaps other pathological conditions adversely affecting seed development in alfalfa, they are not exclusively responsible for these phenomena. Although infesting an unusually wide range of plants in the State, alfalfa appears to be the choicest host plant of these bugs. Both species pass the winter in the adult stage, hibernating in or near the fields under debris, weeds, grass, and crop litter. Activity begins in early spring. In alfalfa most eggs are laid in the terminal 2 in. of the stems. "The incubation period of *Lygus* eggs was found to vary with weather conditions, lower temperatures requiring longer periods. Mean lengths of this period were found to be 12.85 days for 341 eggs in 1931, 13.03 days for 147 eggs in 1932, and 14.93 days for 183 eggs in 1933. The mean time necessary for development from freshly laid eggs to the emergence of adults was found to be as follows: 1931, 37.87 days; 1932, 37.53 days; 1933, 34.15 days. With a preoviposition period approximating 10 days, the total time necessary for the production of each brood of bugs approached 46 days. Data obtained in life history studies indicated the development in Utah of three to five broods annually, varying with the character of growing seasons and climatic conditions in different sections of the State."

Experimental tests of various insecticides have indicated that they are not effective in either destroying or repelling these bugs. None has been discovered that has proved adequate, economical, or practical in controlling them in alfalfa. Some measure of prevention and control of these injurious insects may be obtained by practicing good farm sanitation in keeping ditchbanks, fence lines, roadways, waste places, and all cultivated land free from weeds and crop litter. If such material does accumulate it should be burned in the fall so that it will not afford hibernation quarters for overwintering adult bugs. It is pointed out that seed growers of an entire community or a seed-growing district should adopt a uniform practice with respect to selecting either all first- or all second-growth alfalfa

for the production of the seed crop, as simultaneous occurrence of both first- and second-crop alfalfa provides *Lygus* bugs with most favorable conditions for multiplication.

A list of 21 references to the literature cited is included.

The apple leaf jassid in South Australia, I, H. K. Kemp (*Jour. Dept. Agr. So. Austral., 42 (1938), No. 4, pp. 394–401, figs. 6*).—The apple leaf jassid *Typhlocyba australis* Frogg. has been found in South Australia feeding on the apple, pear, plum, quince, and the deciduous hawthorns. In control work 40 percent nicotine sulfate at 1 in 800 gave efficient control, the spray killing both by direct contact and by the fumigant effect.

An insect vector of the dwarf disease of rice plant, T. Fukushi (*Imp. Acad. [Japan] Proc., 13 (1937), No. 8, pp. 328–331, fig. 1*).—In addition to *Nephotettix apicalis* Motsch. var. *cincticeps* Uhl. (=*N. bipunctatus cincticeps*), long supposed to be the sole agent in the transmission of dwarf disease of rice, *Deltocephalus dorsalis* Motsch. was found to be a vector.

Kenya coffee mealy bug research, A. R. Melville (*East African Agr. Jour., 3 (1938), No. 6, pp. 411–422, figs. 2*).—Report is made of a study of *Pseudococcus kenyae* LeP., a serious pest of coffee and native crops in the Central Province of Kenya which has been introduced into the area without specific natural enemies.

Further studies on the relationship between Hyoscyamus virus 3 and the aphis Myzus persicae (Sulz.), with special reference to the effects of fasting, M. A. Watson (*Roy. Soc. [London], Proc., Ser. B, 125 (1938), No. 838, pp. 144–170*).—A study conducted at the Rothamsted Experimental Station (E. S. R., 76, p. 805) has shown that the green peach aphid is much more likely to transmit the *Hyoscyamus* virus 3 if made to fast immediately before being fed on the source of infection. Its efficiency as a vector increases rapidly during the first hour of fasting, but long periods of starving give but little further increase in infectivity. Infectivity was found to be lost by the aphids after the cessation of infection feeding, and the rate of loss was probably more rapid than the rate at which the virus deteriorates in vitro.

Horticultural aspects of woolly aphis control, together with a survey of the literature, R. M. Greenslade (*Imp. Bur. Fruit Prod. [East Malling, Kent.], Tech. Commun. 8 (1936), pp. 88*).—Following a foreword by R. G. Hatton and a brief introduction, the woolly apple aphid is dealt with under the headings of the insect and its habits (pp. 7–12), effect of climate (pp. 12, 13), control (pp. 13–27), and economic importance (p. 27). A bibliography of 49 pages is included, as is an appendix consisting of a memorandum and questionnaire on the incidence and control of the woolly apple aphid.

Hibernation of the corn ear worm in southern Connecticut, G. W. Barber (*Connecticut [New Haven] Sta. Bul. 419 (1939), pp. 27*).—Report is made of experiments commenced in the fall of 1935 and continued until the spring of 1938 with a view to determining the source of infestation of the corn earworm in southern Connecticut, the details being given in 13 tables. It was found that annual populations began with a few individuals which occurred in the earliest sweet corn during June or July. Populations which occurred during August and September could be traced to natural increases from these first-occurring individuals, when considered in connection with the corn acreage attractive to the ovipositing moths during the season. "Most pupae were found at depths of from 2 to 4 in. below the surface of the soil, but they occurred deeper in sandy than in other soils. Progressive destruction of the emergence burrows, which are dug by the larvae to enable the moths to escape from the soil, occurred in outdoor cages from the time the insects entered hibernation during September until the following summer. Destruction of these burrows was due to several factors, of

which freezing and thawing of the soil, the activity of earthworms, and growth of roots of plants were the most important. Pupae survived the winter in sandy soil at West Dennis, Mass., during 2 yr. and in washed sand at Milford, Conn., during 1 yr. They also survived in cages located in the soil of an open shed at Mount Carmel, Conn., 1 yr. In locations protected from precipitation and extreme ranges in temperature they survived in large numbers. Moths emerged during summer from these locations. It was concluded that the insect survived the winter in certain environments in southern New England at least during some years. The number of survivors seemed adequate to account for the annual infestations that have occurred."

The overwintering pupa of Heliothis armigera Hubn. (obsoleta Fabr.).—I, Effect of temperature and moisture, E. PARRY JONES (*Brit. So. Africa Co. Pub. 6 (1937), pp. 19–36, figs. 2*).—A continuation of studies of the bollworm previously noted (E. S. R., 79, p. 224).

Two egg parasites of the cotton boll worm (Heliothis armigera Hubn. (obsoleta Fabr.)) in Southern Rhodesia, E. PARRY JONES (*Brit. So. Africa Co. Pub. 6 (1937), pp. 37–105, pls. 3, figs. 3*).—Investigations conducted with two of the indigenous egg parasites of the bollworm in Southern Rhodesia, *Telenomus ullyetti* Nixon and *Trichogramma lutea* Gir., are reported.

Larval dispersion of Diatraea saccharalis, R. W. E. TUCKER (*Agr. Jour. [Barbados], 6 (1937), No. 4, p. 157–169 figs. 4*).—Report is made of a series of plat experiments conducted in 1935, 1936, and 1937 in which the number of sugarcane borer eggs laid in sterilized soil was found to be very little different from the number laid in normal plats and showed moth dispersal.

Notes on the biology of Cacoecia longicellana Walsingham, S. NAKAYAMA (*Chosen Govt. Gen. Agr. Expt. Sta. Ann., 9 (1937), No. 3, pp. 417–424, pl. 1; Eng. abs., p. 423*).—Report is made of a study of the biology and control of the apple leafhopper *C. longicellana*, which, with *C. xylosteana* L., a second important pest, attacks both leaves and fruit, particularly in the northern and western apple-growing sections of Chosen (Korea).

Phlyctaenodes bifidalis (Fab.), a new pest of cotton in Brazil (Lepidoptera: Pyraustinae) [*trans. title*], H. F. G. SAUER (*Arch. Inst. Biol. [São Paulo], 8 (1937), pp. 201–210, pls. 2, figs. 3; Eng. abs., p. 209*).—Report is made of biological studies of the pyralid *P. bifidalis*, a new pest occurring on cotton in the State of São Paulo. Recommendations for control include the destruction of the common host plants *Amaranthus hibridus*, *A. spinosus*, *Talinum patens*, and *Portulacca oleracea*.

Codling moth control: Results of tests at Young, S. L. ALLMAN (*Agr. Gaz. N. S. Wales, 49 (1938), No. 4, pp. 217–220, 230, figs. 2*).—Reporting further upon codling moth control work (E. S. R., 74, p. 821), lead arsenate plus white oil is said to have given the best control. White oil plus nicotine sulfate gave good results, and the spray residue was kept within reasonable limits.

Codling moth and Williams pears: Control methods investigated, R. T. M. PESCOTT and L. W. MILLER (*Jour. Dept. Agr. Victoria, 35 (1937), No. 10, pp. 501–512, figs. 9*).—This is a progress report of investigations of codling moth injury to the Williams Bon Chretien variety of pear, the only canning variety in the Goulburn Valley, conducted during the year 1936–37. On the experimental plat at Maroopna the infestation ranged from a mimimum of 5.49 to a maximum of 11.1 percent, with an average infestation of 8 percent over the whole block of more than 1,000 trees. The results of life history studies and control experiments (including spraying in the field and bandaging) are reported upon at length, the details being given in 14 tables.

"In the spraying experiments in the field eight different spray programs were used, the minimum codling moth infestation of 5.49 percent being obtained with a spray program consisting of two calyx and two cover sprays of arsenate of lead (8 lb. to 80 gal. of water). However, there was no significant difference in the control observed with this program and with one of the same number of sprays of arsenate of lead (5 lb. to 80 gal. of water)."

Codling moth and Williams pears: Goulburn Valley investigations, L. W. Miller (*Jour. Dept. Agr. Victoria, 36 (1938), No. 11, pp. 545–561, 572, figs. 12*).—A continuation during the 1937–38 fruit season of the control investigations noted above.

The occurrence of the pink bollworm in the floral parts of the cotton plant in São Paulo during 1936–37 [trans. title], E. J. Hambleton (*Arch. Inst. Biol.* [*São Paulo*], *8 (1937), pp. 249–254, pls. 2; Eng. abs., p. 253*).—The occurrence of the pink bollworm in the floral parts of the cotton plant is reported for the first time in the State of São Paulo. A brief note is given on the activity of the insect and the nature of its attack in the cotton buds and flowers during the season of 1936–37.

Nocturnal habits of Platyedra gossypiella Saunders, F. A. Squire (*Nature* [*London*], *140 (1937), No. 3532, pp. 69, 70, figs. 2*).—Reference is made to observations of the pink bollworm, particularly in the British West Indies, where at St. Vincent light attraction is evident from 8 p. m. to 4 a. m.

An outbreak of Synnoma lynosyrana Walsingham (Tortricidae, Lepidoptera), D. J. Pletsch. (Mont. State Col.). (*Ent. News, 49 (1938), No. 8, p. 231*).—Reference is made to an outbreak in August 1937 of larvae of the tortricid *S. lynosyrana* on rabbit brush (*Chrysothamnus* sp.) growing on range land in Beaverhead County, Mont. The species is known to occur in California, New Mexico, Colorado, and Arizona as well as in Montana.

The effect of delayed fertilisation on the sex ratio of a species of insect in which the female is the heterogametic sex, Ephestia kühniella Zell. (Lepid.: Phycitidae), H. C. James (*Roy. Ent. Soc. London, Proc., Ser. A, 12 (1937), No. 7, pp. 92–98*).—Details of studies conducted with the Mediterranean flour moth are given in four tables. A list of nine references to the literature is included.

Nutritional studies of the webbing clothes moth (Tineola bisselliella Hum.), M. F. Crowell and C. M. McCay (*Physiol. Zool., 10 (1937), No. 3, pp. 368–372*).—The authors find that the nutritional requirements of the webbing clothes moth, in spite of its peculiar feeding habits in nature, may be satisfied by a purified diet consisting of casein, lactalbumin, Harris B concentrate, and fish-meal ash. The value of the fish-meal ash is questionable. Part, or all, of the vitamin B complex is essential for its growth and development. It requires neither fat nor the fat-soluble vitamins. Purified casein is not an adequate protein for the optimum development of the larvae, but purified lactalbumin supplements the casein satisfactorily. The addition of cystine to the casein does not markedly improve its quality.

Indo-Malayan and Papuan microlepidoptera.—I, Notes on the tropical tobacco moth Setomorpha rutella Zeller (Tineidae), A. Diakonoff (*Treubia* [*Buitenzorg*], *16 (1938), No. 3, pp. 399–414, figs. 10*).—These notes relate to the biology and economic importance of *S. rutella*, a well-known pest of various animal and vegetable products which has a circumtropical distribution, being particularly injurious to cured tobacco leaves in the Dutch East Indies. It is known to occur in Hawaii, Texas and Kansas in the continental United States, Central America, South America, and the West Indies, as well as in Asia.

Some notes on the hunchback fly Phora incrassata Mg., F. THOMPSON (*Bee World, 19 (1938), No. 2, pp. 19, 20, figs. 3*).—These notes consist of a brief review of the literature and indicate that the so-called hunchback fly *P. incrassata* may be a parasitic as well as a saprophytic enemy of bee brood.

Humpbacked flies and the honey bee, Z. Ö. PAL (*Bee World, 19 (1938), No. 6, pp. 64–68, figs. 5*).—These notes from the literature, with 26 references, and personal observations supplement the account by Thompson above noted. Further evidence is presented that the so-called hunchback fly may act as a parasite of bee brood. It is shown that *Borophaga (Phora, Peromitra) incrassata* is the correct name of this phorid.

The British mosquitoes, J. F. MARSHALL (*London: Brit. Mus. (Nat. Hist.), 1938, pp. XI+341, pls. 20, figs. 172*).—This work on the morphology, biology, and control of mosquitoes includes a bibliography of 208 titles.

Graphic reproduction of the life cycle of the malaria parasite in the mosquito host, B. MAYNE (*U. S. Pub. Health Serv., Natl. Inst. Health Bul. 170 (1938), pp. III+15, pls. 27*).—The author reviews the life history of the malaria gamete and traces its development from the simple one-celled ameba-like sporozoan in the blood cell of the human host to the multicellular encysted zygote with its mass of pointed spindles, which, migrating to the salivary glands of the winged carrier, rounds out the infective cycle.

Malaria in the Netherlands, N. H. SWELLENGREBEL and A. DE BUCK (*Amsterdam: Scheltema & Holkema, 1938, pp. VIII+267, pls. 2, figs. 23*).—This work includes chapters relating to disease-carrying mosquitoes as follows: The races of *Anopheles maculipennis*, behavior of the short-winged *A. maculipennis*, anopheline malaria, transmission of the malaria parasite from mosquito to man, transmission of the malaria parasite from man to mosquito, and malaria control.

Biology and general morphology of Leucopis griseola Fall. (Chamaemyidae, Diptera), an important predator of Aphis gossypii, and some other aphid pests of crops, H. S. PRUTHI and H. L. BHATIA (*Indian Jour. Agr. Sci., 8 (1938), No. 5, pp. 735–740, pl. 1*).—The chamaemyid dipteron *L. griseola*, an important predator of the cotton aphid feeding largely upon the young aphids, was discovered for the first time in India at Delhi. Notes are given on its habits and economic status, and a description of and the duration of the stages in its life history, together with an illustration of the several instars in colors. The predator larvae have also been found at Delhi preying on the English grain aphid, the green peach aphid (infesting potato), and some unidentified aphids found on hollyhock, palak, mustard, etc.

Studies on warble-flies of Manchuria and Inner Mongolia, S. ONO (*Kitasato Arch. Expt. Med. [Tokyo], 15 (1938), No. 3, pp. 199–246, pls. 8, figs. 3*).—This contribution deals with general aspects of warble fly life; morphology and bionomics; experimental studies (1) of the migration course of the larva in cattle and (2) on the perforation of the skin by the larva; the action of hypodermatotoxin on the germinal cells of the experimental animal which produces abnormal offspring; and the development of warble fly larvae in various experimental animals. It is concluded that both the common cattle grub and the northern cattle grub occur in Manchuria and Inner Mongolia.

The reactions of the housefly (Musca domestica Linn.) to light of different wave-lengths, J. W. M. CAMERON (*Canad. Jour. Res., 16 (1938), No. 11, Sect. D, pp. 307–342, figs. 24*).—The details of the studies conducted are presented in 16 tables and 24 figures. A list of 102 references to the literature is included.

Studies on the chemotropic behaviour of sheep blowflies, M. R. FREENEY (*Austral. Council Sci. and Indus. Res. Pam. 74 (1937), pp. 24, pl. 1, figs. 3*).—

Report is made of a study of the chemotropic responses of sheep blowflies in which the attractiveness of a bait to any species was assumed to be proportional to the number of that species trapped.

A new blowfly attacking sheep in western Scotland, J. MacLeod (*Nature [London], 138 (1936), No. 3489, pp. 467, 468*).—The author reports having found that *Phormia terrae-novae* R. D., a species widely distributed in Europe and North America, acts as a primary blowfly of sheep in western Scotland, initiating strike on relatively clean-wooled areas. While closely related to the important black blowfly (*P. regina*) of sheep in North America, *P. terrae-novae* had not been recorded previously from any country as attacking sheep.

Losses due to the sheep blowfly, M. J. Mackerras (*Jour. Council Sci. and Indus. Res. [Austral.], 11 (1938), No. 2, pp. 97–102*).—Data are given on losses caused by the sheep blowfly *Lucilia sericata* throughout the world.

Biological and systematic notes and records of South African Trypetidae (fruit-flies, Diptera), with descriptions of new species, H. K. Munro (*Union So. Africa Dept. Agr., Ent. Mem. 9 (1935), pp. 18–59, figs. 10*).—The data considered supplement those previously reported (E. S. R., 69, p. 686). A new subgenus is erected, and descriptions are given of 11 species and 1 variety new to science.

Olfactory attractants for male fruit-flies, L. B. Ripley and G. A. Hepburn (*Union So. Africa Dept. Agr., Ent. Mem. 9 (1935), pp. 3–17*).—This is a report of studies of the olfactory reactions of the Natal fruitfly *Ceratitis* (*Pterandrus*) *rosa* Ksh. to baits of certain chemicals conducted over a period of several years with a view to discovery of superior baits and repellents (E. S. R., 67, p. 426). It is concluded that the fruitfly is probably attracted to fruits and fermenting baits by composite odors rather than by any one chemical compound occurring in them.

Fruit fly investigations, 1935, H. W. Simmonds (*Fiji Dept. Agr. Bul. 19 (1936), pp. [1]+18, pls. 4*).—A preliminary account is given of investigations of the bionomics of Fijian fruitflies, three in number, namely, *Chaetodacus passiflorae* Frogg., *C. xanthodes* Broun, and *Chaetodacus* sp. near *distinctus* Mall., including the life history of *C. passiflorae*, the most important species, and several of its natural enemies.

Factors in varietal susceptibility of walnut fruits to attack by the walnut-husk fly, A. R. C. Haas (*Plant Physiol., 12 (1937), No. 3, pp. 721–736, figs. 6*).—In this study the importance of husk hardness as a factor is confirmed, and it is shown that there is a relation between this and other physicochemical properties of husks in the different varieties.

The control of cabbage root fly (Delia (Hylemyia) brassicae Bouché), D. W. Wright (*Jour. Min. Agr. [Gt. Brit.], 45 (1938), No. 8, pp. 812–820, pls. 2*).—The experiments reported suggest that the cabbage maggot on cabbage plants can be most effectively controlled by two applications of a 4-percent calomel dust.

The cineraria leaf miner Phytomyza atricornis damages parks and private gardens, C. R. Wallace (*Agr. Gaz. N. S. Wales, 49 (1938), No. 2, pp. 75, 76, 79, figs. 2*).—It is concluded that the agromyzid leaf miner *P. atricornis*, which causes extensive damage to cineraria in the Sydney district, can be controlled by spraying at intervals of 8 or 9 days with nicotine sulfate 1:400 and soft soap. It is pointed out that both surfaces of the leaves should be thoroughly wetted by the spray.

Researches on the Colorado potato beetle.—IV, Acclimatization of the American entomophagous insect enemies of the Colorado potato beetle [trans. title], J. Feytaud (*Ann. Épiphyt. et Phytogénét., n. ser., 4 (1938), No. 1, pp. 27–93, figs. 25*).—A continuation of a previous contribution (E. S. R., 78, p. 226).

Control of the longhorn beetle Stromatium fulvum (Villers) on valuable furniture in Egypt, M. SHAFIK (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 182 (1938), pp. [1]+9, pls. 4*).—This contribution relates to a beetle occurring in the whole Mediterranean region, southern Russia, and Turkey which attacks dry hardwood and can pass its life cycle in furniture, window frames, doors, and other manufactured wood.

A report on the intestinal protozoa of the larva of the Japanese beetle (Popillia japonica Newm., Coleoptera), S. A. KOWALCZYK (*Amer. Micros. Soc. Trans., 57 (1938), No. 3, pp. 229–244, figs. 21*).—Report is made of a study of the intestinal material from 50 infected larvae of the Japanese beetle, collected from 3 localities, which disclosed species of 5 genera of Mastigophora, 2 of Sarcodina, and 1 genus of Sporozoa. A list is given of 45 references to the literature cited.

Morphology and bionomics of immature stages of Japanese chafer beetles.—I, Anomala cuprea (Hope), H. YUASA and T. ENDÔ (*Jour. Imp. Agr. Expt. Sta., Nisigahara, Tokyo, Japan, 3 (1938), No. 2, pp. 151–182, pls. 2, figs. 5; Eng. abs., pp. 180, 181*).—This contribution, dealing with the results of the investigation of *A. cuprea*, is the first report of studies on the morphology and bionomics of the immature stages of the scarabaeid beetles common in the environs of Tokyo.

The sand wireworm and its control in the South Carolina Coastal Plain, J. N. TENHET and E. W. HOWE (*U. S. Dept. Agr., Tech. Bul. 659 (1939), pp. 39, figs. 17*).—Studies, commenced in 1930, of the sand wireworm, known for nearly 25 yr. as a serious pest of corn, cotton, cowpeas, and other crops of the Coastal Plain of South Carolina and in other restricted parts of the country, are reported. The pest has a 1-yr. life cycle in the State, with approximately 12 days passed in the egg stage, 352 days in the larval stage, 11 days as a pupa, and, in the laboratory, from 10 to 14 days as an adult. No important natural enemies were found during the investigation, nor have any been reported. Direct control of this insect is not practical, but a large measure of relief from the pest can be obtained by the following practices: Land resting, attention to favorable planting dates, avoidance of attracting the egg-laying female beetles, and building up soil fertility with humus. An acceptable crop rotation has been very successful.

The control of scarabee (Euscepes batatae Waterh.) in Barbados, R. W. E. TUCKER (*Agr. Jour. [Barbados], 6 (1937), No. 4, pp. 133–156*).—A detailed account is given of the life history of the West Indian sweetpotato weevil, attention being drawn to the protected hidden singly laid eggs, low life cycle mortality, high reproductive capacity, and hardiness of the adult beetles. Only one alternate host plant, restricted to the seashore, is known in Barbados, and no natural enemies have been observed.

Control experiments conducted over a period of 3 yr. showed in all cases that three consecutive sprayings of the potato vines with lead arsenate plus a sticker reduced infestation and increased yields to an outstanding extent.

The bark beetles of Minnesota (Coleoptera: Scolytidae), H. R. DODGE (*Minnesota Sta. Tech. Bul. 132 (1938), pp. 60, pls. 4*).—Following a brief introductory account, the economic importance, control measures, natural control, life history and habits, and galleries of the scolytid beetles of Minnesota are considered and field keys to the galleries of these beetles, of which 64 species occur in the State, presented. Reference is made to the morphological characters, and a key given to the genera known or likely to occur in Minnesota is followed by notes on the species including a key for their separation giving name or other synonymy, host, morphological characters, and biology when known. A bibliography of three pages is included.

A cytological study of the gregarine parasites of Tenebrio molitor, using the ultra-centrifuge, M. I. Daniels (*Quart. Jour. Micros. Sci. [London], n. ser., 80 (1938), No. 318, pp. 293–320, pl. 1, figs. 2*).—Three gregarine species were found by the author to inhabit the midgut of larvae of the yellow mealworm, namely, *Gregarina cuneata* Stein, *G. polymorpha* Hamm, and *G. steini* Berndt. The contribution is accompanied by a list of 45 references to the literature.

The strawberry crown borer (Tyloderma fragariae (Riley)), P. O. Ritcher (*Kentucky Sta. Bul. 389 (1939), pp. 35, figs. 11*).—A study commenced in February 1937 of the morphology, biology, and natural enemies of and control measures for the strawberry crown borer, the worst insect pest of this crop in the State for 40 yr., is reported. Work was conducted in the counties of McCracken, Ballard, Caldwell, Lyon, and Fayette, and the report includes several records made by H. Garman in earlier years. In addition to the cultivated strawberry, the crown borer was found breeding in common cinquefoil, which is abundant and often the source of infestation for nearby berry patches, and in the wild strawberry. Usually passing the winter in the adult stage under trash or in the soil, it commences egg laying early in March. A very few crown borers pass the winter within infested plants and mature in February and March. The eggs, of which 142 was the maximum number produced by a female, are always laid in the strawberry plant, usually being deposited in excavations made in the crown or old leaf bases slightly above the origin of the lateral roots and close to the soil surface. Plants attacked by the larvae are killed, stunted, or may show no other effects except a reduction in number of runners and runner plants. In dry years entire fields are often destroyed by the crown borer. In western Kentucky pupation commenced between June 10 and 16 in 1937 and 1938. The first-generation adults began emerging late in June. In 1937 a small second generation was reared at Princeton. One parasite, *Microbracon analcidis* Ashm. and two predators, *Monocrepidius auritus* Herbst and *Hister americanus* Payk. were found attacking the crown borer. *Tyloderma foveolata* (Say), a close relative of the crown borer, was common in strawberry patches, but breeds in *Oenothera laciniata* Hill and is not a strawberry pest.

The results obtained from insecticides and barriers tested as means of control do not warrant their use. The work has led to the recommendation that (1) new strawberry patches be set at least 350 yd. from a source of infestation, (2) plants for new patches be dug between December 1 and March 1, (3) preference be given to certified plants for setting new patches, (4) strawberry patches be set only on land in cultivation for 1 or more years, (5) all berry patches be destroyed after the second year of picking, and (6) the common cinquefoil be destroyed.

A list is given of 19 references to the literature.

The banana beetle borer: Investigations and control measures, R. Wallace (*Agr. Gaz. N. S. Wales, 48 (1937), No. 11, pp. 621–623, 638, fig. 1*).—This contribution gives a generalized account of the main conclusions drawn from experiments extending over the past 4 yr. on the banana root borer, a weevil found in most banana-growing countries of the world. The beetle has been shown to have a decided preference for dead or spent plant material. The best control measure consists of the provision of good growing conditions.

The granary weevil (Calandra granaria L.): Its biology and control [trans. title], K. T. Andersen (*Monog. Angew. Ent., No. 13 (1938), pp. 108, pl. 1, figs. 36*).—A report of studies of the biology and control of this insect, presented with a list of 86 references to the literature.

The embryonic development of Calandra oryzae, O. W. TIEGS and F. V. MURRAY (*Quart. Jour. Micros. Sci.* [*London*], *n. ser., 80* (*1938*), *No. 318, pp. 159–284, pls. 6, figs. 19*).—This contribution is accompanied by a list of 97 references to the literature.

The histology of larvae affected with European foul brood, H. L. A. TARR (*Bee World, 19* (*1938*), *No. 5, pp. 56–59, figs. 8*).—The author presents a series of photomicrographs illustrating the manner in which *Bacillus pluton* invades the bee larva and develops at different stages of the disease.

Honeybee monstrosities, J. E. ECKERT. (Univ. Calif.). (*Amer. Bee Jour., 78* (*1938*), *No. 11, pp. 504, 505, fig. 1*).

Host-selection in Pimpla examinator F. (Hymenoptera), D. J. JACKSON (*Roy. Ent. Soc. London, Proc., Ser. A, 12* (*1937*), *No. 7, pp. 81–91, pl. 1*).—Following a list of the recorded hosts of the parasite *P. examinator*, its life history is summarized and a description given of the habit of the female in puncturing pupae for feeding and oviposition, presented with a list of 19 references to the literature.

The Nearctic species of Netelia (Paniscus of authors) and a revision of the genera of Neteliini (Hymenoptera, Ichneumonidae), H. K. TOWNES, JR. (Cornell Univ.). (*Lloydia, 1* (*1938*), *No. 1–4, pp. 168–231, pls. 8*).—A revision of a group of ichneumonids that are external parasites upon lepidopterous larvae. Seventy-nine forms are recognized, of which 58 species and 2 subspecies are described as new to science.

Euplectrus agaristae Craw.: A parasite of the grape vine moth Phalaenoides glycine Lew., N. S. NOBLE (*N. S. Wales Dept. Agr., Sci. Bul. 63* (*1938*), *pp. 27, figs. 9*).—An account of the life history of *E. agaristae*, an external gregarious parasite of the larvae of the grapevine moth *P. glycinae* in New South Wales. This chalcidoid parasite of the family Eulophidae is said to be common in the Sydney district, and has also been taken at Maclean on the north coast and at Goulburn on the southern tablelands. A list of 33 references to the literature cited is included.

Rhaconotus scirpophagae Wlk., a parasite of the sugarcane white moth borer (Scirpophaga), M. C. CHERIAN and P. ISRAEL (*Madras Agr. Jour., 26* (*1938*), *No. 4, pp. 127–134, pl. 1*).—Information on the habits and life history of *R. scirpophagae*, its egg-laying capacity, longevity, etc., is presented, the details being given in four tables. It is said to be fairly efficient in the control of the sugarcane white moth borer (*Scirpophaga* sp.) under south India conditions.

The life cycle of Nosema carpocapsae, a new microsporidian parasite of the codling moth (Laspeyresia pomonella L.) [trans. title], A. PAILLOT (*Compt. Rend. Soc. Biol.* [*Paris*], *127* (*1938*), *No. 12, pp. 1138–1140*).—This sporozoan parasite of the codling moth has been under observation by the author in France since 1936. The name *N. carpocapsae* is proposed. It appears to be of little importance as a means of natural control of the moth.

Life history notes on the crucifer sawfly, Y. W. DJOU (*Lingnan Sci. Jour., 17* (*1938*), *No. 1, pp. 83–86, figs. 3; Chin. abs., p. 86*).—These notes relate to the biology of the crucifer sawfly (*Athalia* sp.), which feeds on the leaves of water cress in China and also attacks Chinese kale.

A revision of the mites of the subfamily Tarsoneminae of North America, the West Indies, and the Hawaiian Islands, H. E. EWING (*U. S. Dept. Agr., Tech. Bul. 653* (*1939*), *pp. 64, figs. 25*).—In this revision of the mites of the subfamily Tarsoneminae 31 forms, representing 3 genera (*Pseudotarsonemoides* Vitzthum, *Tarsonemus* Canestrini and Fanzago, and *Hemitarsonemus* n. g.) are recognized, of which 18 species are described as new to science. Locality and host records are given for each species. The group, which is widely distrib-

uted, being found throughout the warmer parts of the world, has long been recognized as of much economic importance because of the injury many of them cause to cultivated plants. Methods of collecting and mounting tarsonemid mites are described. The characters of taxonomic importance, including the segmentation and chaetotaxy of the fourth pair of legs, are discussed in detail. A key (1) to the 3 genera, (2) to the known males of North American species, and (3) to some of the females of North American species, of *Tarsonemus*, and a list of 35 references to the literature cited are included.

The European red mite and its control, P. Garman and J. F. Townsend (*Connecticut [New Haven] Sta. Bul. 418 (1938), pp. 34, figs. 6*).—This account of the European red mite, which first attracted attention in Connecticut in 1920 and from 1930 to 1936 became abundant in apple orchards, deals briefly with its life history and habits, outbreaks, and the use of sprays, followed by a report of experimental results and field observations, the details being given in 17 tables. Suggestions based upon the work are offered to growers. These include a dormant or delayed dormant application of 3 or 4 percent oil if clusters of eggs are found frequently on the twigs or heavily infested centers appear on the twigs and branches. Use 1.25 percent white lubricating oil emulsion during the last week of June or the first week of July, combining lead arsenate for maggot control but omitting all sulfur. A list of 29 references to the literature is included.

A population study of the red-legged earth mite Halotydeus destructor in Western Australia, with notes on associated mites and Collembola, K. R. Norris (*Austral. Council Sci. and Indus. Res. Pam. 84 (1938), pp. 23, figs. 10*).—Studies of the earth mite *H. destructor* (Tucker), a predator of the lucerne flea *Sminthurus viridis* L. which caused severe damage to clover early in 1935, have shown three generations to occur during a season at Guildford, Western Australia.

The ticks of Brazil and some other South American republics [trans. title], H. B. Aragão (*Mem. Inst. Oswaldo Cruz, 31 (1936), No. 4, pp. 759–844, pl. 1, figs. 5*).—It is stated that 45 well-established species of ticks, representing 8 genera, are recognized from Brazil, 29 representing the genus *Amblyomma*. Their importance is emphasized, as in addition to transmitting treponemiasis, piroplasmosis, and anaplasmosis to several domestic animals in Brazil, ticks (*A. cajennense* Fab. and *A. striatum* Koch) are responsible for the transmission of Brazilian Rocky Mountain spotted fever. They also harbor the virus of yellow fever, and *A. cajennense* and *Ornithodoros rostratus* Aragão even transmit it in laboratory experiments.

The publication includes tables for the separation of the genera and species of ticks known to occur in Argentina, Bolivia, Colombia, Paraguay, and Venezuela, as well as Brazil, and a description of a new variety under the name *Argas persicus dissimilis*. Their life history, bionomics, distribution, etc., are considered, and a list is given of 57 references to the literature.

ANIMAL PRODUCTION

Abstracts of papers, 96th meeting, American Chemical Society (*Amer. Chem. Soc. Mtg., 96 (1938), Abs. Papers, pp. 16, 17; 3, 4, 7, 8, 9, 19, 25, 26, 27, 28*).—Abstracts of the following papers, dealing with subjects of significance in animal nutrition from the agricultural and food chemistry and biological chemistry sections, are noted: An Improved Method for the Determination of Carotene in Silage, by D. M. Hegsted, J. W. Porter, and W. H. Peterson, and Carotene and Vitamin A Content of Wisconsin Milks, by A. C. Dornbush, F. R. Olson, and

W. H. Peterson (both Univ. Wis.); The Petroleum-Phasic Carotenoids of Egg-Yolk, by W. J. Peterson, J. S. Hughes, and W. M. Proudfit (Kans. State Col.); Chondroitin as a Growth Factor for the Chick, by R. E. Gray, H. E. Robinson, F. F. Chesley, and L. A. Crandall; Vitamin C in Fresh Milk as Related to Other Constituents of the Milk, and to the Stage and Persistency of Lactation, by C. H. Whitnah (Kans. Expt. Sta.); Fat Balance Studies With the Pullet on Fat-Low and Normal Rations, by W. C. Russell, M. W. Taylor, and H. A. Walker (N. J.); The Determination of Sugar Tolerance in the Chicken, by J. W. Cavett; Anemia Studies With Dogs, by V. R. Potter, C. A. Elvehjem, and E. B. Hart (Univ. Wis.); The Influence of Arsenic in the Diet on the Toxicity of Seleniferous Grain, by A. L. Moxon (S. Dak. State Col.); and The Effect of High Temperatures on the Blood Calcium of Laying Hens, by R. M. Conrad.

[**Livestock investigations in Alabama**] (*Alabama Sta. Rpt. 1937, pp. 16–20, 23, 24*).—Results are briefly reported for the following studies: The cost of beef production in eastern Alabama, peanut hay as a roughage for fattening steers and for wintering breeding cows, kudzu as a grazing crop for beef cattle and for hogs, and the transmission of factors related to the economical production of swine, all by J. C. Grimes; the use of ice in curing pork on the farm, by W. E. Sewell; a comparison of dry rations for dogs, the comparative nutritive requirements of dogs and rats, both by C. J. Koehn; and the supplemental value of peanuts to the chick and laying ration, by G. J. Cottier and D. F. King.

[**Livestock investigations in Iowa**] (*Iowa Sta. Rpt. 1938, pts. 1, pp. 84–88, 91–96, 97, 99–101; 2, pp. 69–71*).—Brief progress results of studies (E. S. R., 79, p. 520) reported in part 1, by C. C. Culbertson, J. L. Lush, M. D. Helser, F. J. Beard, B. H. Thomas, J. A. Schulz, S. H. McNutt, P. M. Nelson, P. S. Shearer, A. B. Caine, and L. Yoder, include the evaluation of swine breeding stock by determining the growth, gains, ability to utilize feed, and carcass quality of the offspring; the relation of vitamin E to reproduction of swine and sheep; the adaptability of the rat for studying the chemical relationships between the food ingested and the softness of body fat; the influence of different amounts of soybeans and their products upon the quality of pork and keeping quality of lard; the influence of low temperatures upon beef and pork held in storage for different intervals; the factor present in linseed oil and linseed oil meal responsible for finish on fattening steers; factors involved in the production of colts; and the production of derivatives of sterols and their role in nutrition.

Reports of poultry investigations under the leadership of E. W. Henderson, H. L. Wilcke, Thomas, H. Giese, C. Murray, C. D. Lee, N. F. Waters, and B. Lowe include the biological value of different levels of meat scraps and milk combinations for egg production and the influence of rations and management on egg quality and size, a comparison of avian embryonic growth rates as measured by nitrogen and ash content, the air requirements of poultry, the effect of levels and sources of proteins and inorganic elements in the ration on slipped tendon in chicks and poults, the biological efficiency of several protein fractions for numbers, size, and quality of eggs, the relation of the viscosity index to the hatchability of eggs, the tolerance of poultry for fat in the ration, the comparative efficiency of some protein supplements for growth and nitrogen retention of chicks, factors in oats which affect growth and feathering in fowls, and the effect of the ration and the fattening period upon gains and quality of market poultry.

In part 2, results are briefly noted on a comparison of long corn fodder, cut fodder, ground fodder, and corn silage for finishing steer calves in dry lot, by Culbertson, Shearer, Helser, Beard, and Thomas.

[Experiments with livestock by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1938, pp. 87–89, 90, 91, 95–99, 144, 145, 147, 148, 149, 150*).—Reports of investigations with farm animals, by F. B. Morrison, J. P. Willman, E. L. Worthen, R. W. Pease, N. F. Smith, G. M. Cairns, V. H. Melass, P. Olafson, S. A. Asdell, R. B. Hinman, J. I. Miller, C. M. McCay, L. A. Maynard, R. A. Rasmussen, G. K. Davis, G. Sperling, L. Barnes, G. Ellis, G. Kimball, M. J. Babcock, and K. Mills, include large-scale sheep and wool production in New York, distillers' corn dried grains and brewers' dried grains for fattening lambs, the relation of feeding and management to the cause of the stiff-lamb disease, a comparison of forage crops as temporary pastures for lambs, a comparison of various protein, vitamin, and mixed supplements for pigs, rations and methods of feeding the lactating sow and her suckling pigs, the causes and prevention of birth mortality in pigs, the protein requirements of fattening yearling cattle, the nutritive value of the proteins in common protein-rich supplements and in typical legume and nonlegume rations, the requirements of Herbivora for the B group of vitamins, cod-liver oil injury in Herbivora, and the prolongation of productive life of animals.

Reports of poultry investigations, by L. C. Norris, G. F. Heuser, G. O. Hall, and A. L. Romanoff, include the requirements of poultry for the components of the vitamin G complex, protein concentrates for laying hens, the role of manganese in poultry nutrition, the value of yeast in poultry feeding, the effect of controlled temperature and different light rays on breeding birds, and the early detection of infertile eggs.

[Livestock investigations in Oklahoma] (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. 39–62, 63, 64, 152–160, 163–175, 177–180, figs. 6*).—Results are briefly reported for the following studies: The relative value of cattle fattening rations containing different proportions of molasses and corn, the comparative value of corn-molasses v. oat-molasses rations for fattening cattle, a comparison of prairie hay, alfalfa, cottonseed hulls, and sorghum silage as roughages for wintering steer calves, and tests to determine the cheapest available sources of concentrates for wintering steers, all by W. L. Blizzard; the value of creep feeding in the production of early calves and heifers, by B. R. Taylor; the value of mineralized yeast for fattening pigs, and the value of molasses in combination with oats and corn for hogs, both by C. P. Thompson; the effect of protein levels on prenatal development of pigs, by Thompson and J. C. Hillier; the effect of inbreeding swine, by W. A. Craft and O. S. Willham; corn v. cottonseed meal and prairie hay v. alfalfa for fattening lambs, the economic returns for feeding grain to lambs on wheat pasture, the value of flushing breeding ewes, the returns secured from creep-feeding lambs, the effect of age of sheep on wool characters, and the effect of molasses in the sheep ration on digestibility of fats, all by H. M. Briggs; good management as a means of correcting stiff joint ailment of lambs, by Briggs, V. G. Heller, and L. H. Moe; and methods of curing home-killed pork and lamb, by J. A. Beall.

From poultry investigations results are noted on the effect of cottonseed meal in the ration on egg quality, poor sanitation as related to egg quality, and the value of evaporation-type egg cooler, all by R. B. Thompson and C. A. Roberts, the optimum crude fiber level for chickens and turkeys, and the effect of all-night lighting of the flock during winter months, both by R. Penquite; the effect of protein level on egg production and size, growth rate, and viability of chicks, by Penquite and T. T. Milby; methods of preventing slipped tendon in chicks, by Penquite and Heller; the relation of body conformation (live bird measurements) to market quality of chicks and turkeys, by Penquite and R. G. Jaap; breed variations in body form, by Jaap; optimum protein

levels for turkeys, the value of dried grasshoppers for poults, the range requirements of turkeys, and the value of all-night lighting for breeding turkeys, all by Milby; and a State-wide turkey grading program (coop. U. S. D. A.), by Roberts, R. B. Thompson, A. W. Jacob, H. G. Ware, and L. Morris.

[Livestock investigations in Pennsylvania] (*Pennsylvania Sta. Bul. 367 (1938), pp. 7, 24–29, 31, 54–57, figs. 2*).—Studies for which results are briefly reported include the relative efficiency of gains in Good, Medium, and Common feeder steers and a comparison of corn silage, alfalfa-molasses silage, and alfalfa hay as roughages for fattening steers, by F. L. Bentley and P. T. Ziegler; optimum levels of soybean oil meal for lambs and hothouse lamb production, by T. B. Keith and W. L. Henning; factors affecting the quality of Merino wool, by Henning and R. C. Miller; protein requirements of pigs, by Keith, M. A. McCarty, and Miller; the curing of frozen hams, by Miller and Ziegler; causes of phosphorus deficiency in cattle, by E. B. Forbes and S. R. Johnson; the effect of deficiencies in essential nutrients, by Forbes; the specific dynamic action of proteins, by M. Kriss; the manganese requirements of the rat, by R. A. Dutcher and N. B. Guerrant; and determinations by A. K. Anderson of the allantoin content of bovine blood.

From poultry investigations results are reported on the value of dried skim milk for chickens and the vitamin A requirements of poultry, by H. C. Knandel and R. V. Boucher; factors affecting sexual development of chickens, by E. W. Callenbach and J. E. Nicholas; factors affecting the quality of eggs, by D. R. Marble, Nicholas, and Knandel; the comparative nutritive value of firm and watery egg albumin, by Dutcher and Guerrant; fishy flavor and odor in turkeys, by R. R. Murphy, Boucher, and Knandel; and the breeding of chickens for livability, by Marble.

[Experiments with livestock in South Carolina] (*South Carolina Sta. Rpt. 1938, pp. 75, 76, 77, 83–85, 95–98, 99*).—Results are briefly presented for the following lines of investigation, by L. V. Starkey, E. G. Godbey, E. D. Kyzer, R. L. Jones, and J. H. Mitchell: A comparison of silage v. cottonseed hulls in the winter ration of beef cows, the use of a reserved permanent pasture for shortening the winter feeding period of beef cows, cottonseed meal and hulls v. corn and alfalfa hay for fattening steers, creep feeding v. noncreep feeding of beef calves, sorghum silage v. rye pasture for wintering stocker steers, the effect of phosphorus fertilizer treatments on the beef-producing capacities of Coastal Plains pastures, a comparison of crossbred v. purebred pigs from double litters, a comparison of protein supplements for fattening hogs on rye forage, and the use of floored pens v. large dry lots in the feeding of fattening hogs.

Reports of poultry investigations, by C. L. Morgan and R. C. Ringrose, include the effect of cottonseed meal and cottonseed oil in laying rations on the hatchability of eggs, the value of whole oats in laying rations, and the influence of different components of the ration upon cannibalism in poultry.

[Animal husbandry investigations in Texas]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1937, pp. 17–20, 24–26, 27, 28, 29, 44–57, 132–134, 137–140, 161, 173, 182, 227–229, 234, 235, 245–249, 257, 258, 262, 263, 264, 265, 270*).—Progress results (E. S. R., 79, p. 85) of beef cattle investigations, by J. M. and J. H. Jones, R. E. Dickson, H. Schmidt, T. W. Workman, G. S. Fraps, A. R. Kemmerer, J. K. Riggs, P. R. Johnson, R. A. Hall, J. A. Bayles, E. K. Crouch, E. H. Hansel, E. B. Reynolds, R. H. Stansel, W. H. Black, L. H. Tash, W. H. Dameron, O. L. Carpenter, F. E. Keating, and S. Cover, include the vitamin A and carotene requirements for growing and fattening cattle, the mineral requirements of cattle, the value of dried citrus peel and pulp meal for fattening cattle, the maximum use of roughages and optimum levels of hegari fodder and alfalfa

hay in fattening rations, the mineral and protein deficiencies of pastures in the east Texas forest region, the ineffectiveness of cottonseed cake and prairie hay for wintering beef heifers, the carrying capacity of unimproved and improved pastures, the effect of mineral deficiencies on range beef cattle production, the efficiency of feed utilization by feeder calves fed singly and in groups when full-fed and when fed limited rations, and the effect of additional fat (cottonseed oil) in cottonseed meal-silage rations for steers.

Studies with sheep and goats, by J. M. and J. H. Jones, Dickson, Schmidt, Fraps, Kemmerer, Dameron, Carpenter, Cover, A. K. Mackey, C. E. Murphey, S. P. Davis, B. L. Warwick, and D. A. Spencer, include the vitamin A requirements of sheep and goats, the effectiveness of feeding cottonseed meal and mixtures of cottonseed meal, salt, and lime in preventing bitterweed trouble and promoting growth of range sheep, the effect of degree of fatness on tenderness and flavor in lamb, the relation of age of animals to fineness of wool and mohair, determining the grades and shrinkage of wool and mohair, the adaptability of Corriedale sheep to southwest Texas conditions, and the value of crutching or tagging bred ewes.

The results of swine studies are noted on the vitamin A requirements of pigs, by F. Hale and Fraps; methods of feeding brood sows, Sudan grass and oat pasture for fattening hogs, the calcium requirements for growing and fattening pigs receiving cottonseed meal, all by Hale; storing sliced cured bacon in different oils, by Cover and Hale; and a comparison of methods for storing home-cured hams and bacon, by Hale, R. Snyder, and D. L. Jones.

The palatability of the grain of various pure and crossbred strains of sorghums was studied by J. R. Quinby and J. C. Stephens, and the hardness of cottonseed cake by F. D. Fuller and J. Sullivan.

Poultry studies, by R. M. Sherwood, J. R. Couch, and Fraps, gave information on factors involved in the slipped tendon disease of chicks, and the quantitative requirements of the chick for vitamin A, vitamin D, and calcium and phosphorus.

Chemical studies, by Fraps, Kemmerer, E. C. Carlyle, and J. F. Fudge, relate to the productive energy values of animal feeds and human foods, the vitamin content of commercial feeds, and the iodine content of Texas feeds and waters.

[**Animal nutrition in Wisconsin**] (*Wisconsin Sta. Bul. 442 (1938), pp. 83–92, 93–96, figs. 2*).—Studies for which results are reported include the cobalt requirement of animals, by E. J. Underwood; the fluorine content of the bones of young calves, by R. J. Evans and P. H. Phillips; the effect of heat on the growth-promoting power of edestin, by H. A. Waisman and C. A. Elvehjem; the ability of calves to utilize simple nitrogen compounds as a substitute for proteins, by E. B. Hart, G. Bohstedt, and M. I. Wegner; the composition, keeping quality, and feeding value of legume silages prepared with preservatives and with additions of mineral acids, molasses, or whey, by W. H. Peterson et al.; the effect of feeding alfalfa silage on the vitamin A content of milk, by Peterson, A. C. Dornbush, and F. R. Olson; properties and behavior of the "grass juice factor," by G. O. Kohler, S. B. Randle, Elvehjem, and Hart; the role of manganese and rice bran in preventing slipped tendon in poultry, by A. C. Wiese, B. C. Johnson, Elvehjem, Hart, and J. G. Halpin; the ineffectiveness of nicotinic acid as a cure for chick pellagra, by Elvehjem, Waisman, O. Mickelson, and D. W. Woolley; chondroitin as a preventive of gizzard lesions in chicks, by H. R. Bird, J. J. Oleson, et al.; and histopathological changes occurring in curled toe paralysis, slipped tendon, and vitamin B_4 deficiency of chicks, by R. W. Engel and Phillips.

Radioactive phosphorus as an indicator of phospholipid metabolism, I–IV. (Univ. Calif.). (*Jour. Biol. Chem., 122 (1937), No. 1, pp. 169–182, figs. 6; 123 (1938), No. 2, pp. 587–593, figs. 3; 124 (1938), No. 3, pp. 795–802; 126 (1938), No. 2, pp. 493–500, figs. 3*).—Four reports on this study are noted.

I. *The rate of formation and destruction of phospholipids in the fasting rat*, I. Perlman, S. Ruben, and I. L. Chaikoff.—A method for the preparation of the radioactive isotope of phosphorus is briefly described. In two series of rat feeding trials in which disodium phosphate (radioactive) was incorporated in the diet, the percentage of the labeled phospholipid present in the gastrointestinal tract, liver, kidneys, carcass, and the whole body at various intervals after feeding was determined. The labeled phospholipid appeared in all tissues examined.

II. *The rôle of the stomach, small intestine, and large intestine in phospholipid metabolism in the presence and absence of ingested fat*, B. A. Fries, S. Ruben, I. Perlman, and I. L. Chaikoff.—Rats were fed diets containing the radioactive phosphorus, and a comparison was made of the phospholipid turn-over in various parts of the gastrointestinal tract. Either in the absence or presence of ingested fat, the major part of the phospholipid turn-over occurred in the small intestines, the stomach and large intestines having but a small part in this type of metabolism. Removal of both gastrointestinal tract and kidneys which were very active in phospholipid metabolism had little effect on the phospholipid turn-over in the liver.

III. *The conversion of phosphate to lipoid phosphorus by the tissues of the laying and non-laying bird*, C. Entenman, S. Ruben, I. Perlman, F. W. Lorenz, and I. L. Chaikoff.—Laying and nonlaying (molting) White Leghorn hens were sacrificed at 6 or 12 hr. after receiving injections of radioactive phosphorus, and the percentage recovery of this substance in different body tissues was determined. About 5 percent of the labeled phosphorus administered appeared as phospholipids in the whole body, with about 2 percent contained in the bone, muscle, and blood. Per 100 gm. of tissue the greatest amounts of this substance were present in the kidneys, livers, and small intestines. The blood, oviduct, and ovary of the laying hens showed greater phospholipid activity than those of nonlaying birds. The labeled phospholipid was present in egg yolks 6 hr. after administration and present in greater quantities after 12 hr. The amount deposited in yolks followed the increase in yolk size until a yolk weight of 5.8 gm. was reached.

IV. *The phospholipid metabolism of the brain*, G. W. Changus, I. L. Chaikoff, and S. Ruben.—Trials with rats showed that following the ingestion of labeled phosphate the radioactive phospholipid was deposited in the brain at a much slower rate than the liver, kidneys, or small intestines. Progressive increase in the content of this phospholipid in the brain was observed as long as 200 hr. after administration. After the maximum amount of this phospholipid had been deposited in the brain its loss occurred at a very slow rate, its presence being detected as long as 4 weeks after being fed. The rate of formation of brain phospholipid was identical in the fed and fasted rats, larger amounts being stored in the young than in the adult brain.

Studies on the relative efficiency of vitamin D from several sources, I, II, J. T. Correll and E. C. Wise (*Jour. Biol. Chem., 126 (1938), No. 2, pp. 573–588, fig. 1*).—The results of two studies are reported, dealing respectively with the influence of vitamin D of different origins on (1) bone ash and body weight and (2) on the serum phosphatase of the chicken.

Comparative tests in which chick rations were supplied with different levels of vitamin D from a number of commercial samples of tuna-liver oil and cod-liver

oil indicated that, rat unit for rat unit, the tuna-liver oil was only from 40 to 60 percent as effective as the cod-liver oil for chicks as measured by bone ash content. The former sources of vitamin D were also much less efficient than the latter in promoting growth of chicks during the first few months of life.

The serum phosphatase concentration in 2-day-old chicks was found to be about 80 Bodansky units per 100 cc. When adequate amounts of vitamin D were supplied the concentration of serum phosphatase rapidly declined, approaching a level of 20 units per 100 cc., but in the absence of vitamin D the concentration increased to over 200 units per 100 cc. in highly rachitic chicks. On a rat-unit basis supplements of cod-liver oil proved more efficient than irradiated ergosterol or the tuna-liver oils in reducing the phosphatase activity in the serum of growing chicks.

Further studies on dietary factors associated with nutritional muscle dystrophy, S. Morgulis, V. M. Wilder, and S. H. Eppstein. (Univ. Nebr.). (*Jour. Nutr., 16 (1938), No. 3, pp. 219–227, figs. 5*).—Previous findings (E. S. R., 76, p. 882) indicating that two or more nutritive factors are involved in the prevention or cure of muscular dystrophy in rabbits were further confirmed in this study. All the effective factors were found to be present in acetone extracts of wheat germ oil and to a lesser extent in cottonseed oil. Also the feeding of green lettuce in large amounts as a supplement to the basal diet cured dystrophic rabbits. When whole wheat germ was fractionated into its fat-soluble and water-soluble components neither fraction alone prevented or cured dystrophy, but when the two extracts were fed together severely dystrophic rabbits quickly recovered and grew vigorously. Further tests indicated that the fat-soluble fraction is closely associated, or perhaps identical, with vitamin E. The water-soluble fraction evidently belongs to the vitamin B complex since it is supplied by lettuce, yeast, and a variety of vitamin B concentrates.

Commercial feeding stuffs, L. S. Walker, E. F. Boyce, and L. E. Davis (*Vermont Sta. Bul. 443 (1938), pp. 48*).—This is the usual report of the analyses for protein, fat, and fiber of 1,694 samples of feeding stuffs collected for official inspection during April 1938 (E. S. R., 79, p. 669).

The nutritive value of distillers' by-products, A. D. D'Ercole, W. B. Esselen, Jr., and C. R. Fellers. (Mass. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 1, pp. 89–95*).—Distillers' grains and concentrated distillers' slop were assayed with reference to vitamins A, B_1, B_2 (riboflavin), C, and D and protein quality. All assays were with rats except for B_2 and protein quality, in which cases both rat and chick methods were used. The grain and slop, respectively, contained 2 and 5.4 Sherman units of B_1, 2.4 and 3 Sherman units of B_2, and 14 and 15.6 Cornell units of B_2 per gram. Both materials were practically devoid of vitamin A activity and contained only small amounts of antirachitic substance. The slop contained a small amount of a vitamin C-like material. The proteins of these products were relatively poor in growth-promoting properties. It is suggested that the addition of from 10 to 15 percent of these products to poultry rations should provide an economical and satisfactory source of vitamin B_1 and riboflavin and would also supply desirable minerals.

Oat mill feed: Its usefulness and value in livestock rations, A. W. Lathrop and G. Bohstedt, in collab. with A. H. Walker and H. J. Deobald (*Wisconsin Sta. Res. Bul. 135 (1938), pp. 128, figs. 20*).—The results of extensive investigations dealing with the composition and digestibility of oat mill feed and its usefulness and value for horses, swine, lambs, fattening cattle, and dairy cows and heifers, are summarized.

This product contained an average of 5.5 percent crude protein, 27.9 crude fiber, and 6.4 ash. It contained only small amounts of calcium and phosphorus

and vitamins A and D. Digestion trials with horses, cattle, and sheep indicated total digestible nutrient values of 35.2, 33.8, and 37.9 percent, respectively (average 35.6), while trials with swine gave a value of only 22.4. Horses at light or medium hard work were satisfactorily maintained for nearly 6 yr. on oat mill feed alone, and in short trials this product had approximately the same value as timothy hay. Respiratory and digestive disturbances were occasionally encountered under certain conditions of feeding. When oat mill feed replaced from 16 to 24 percent corn or hominy feed in swine fattening rations, the rate of gain and quality of finish were practically equal to those of the check lots. Up to 30 percent oat mill feed could be included in the ration of pigs on rape pasture. The feed replacement value of the oat mill feed generally ranged from 25 to 48 percent of the value of ground corn. Up to 40 percent oat mill feed in the ration of bred sows on pasture gave good results. In practical bred sow rations the values ranged from 29 to 49 percent that of ground corn. In trials with lambs, in which the oat mill feed replaced 30 percent of corn or a part or all of the alfalfa hay, its replacement value was from 26 to 45 percent of corn and 60 percent that of alfalfa. When oat mill feed replaced from 15 to 30 percent of corn or hominy feed in cattle fattening rations, a good quality roughage was provided, satisfactory gains and finish were obtained, and its replacement value was from 30 to 40 percent that of corn. The oat mill feed failed to maintain the health of beef cattle when fed as a sole roughage. When fed to dairy cows in combination with silage, oat mill feed was 96 and 78 percent as valuable as timothy and alfalfa, respectively, and when fed as 40 percent of the concentrate ration was 50 and 65 percent as valuable as corn and wheat bran, respectively. It was worth 35 percent as much as corn when fed with silage and protein concentrates to dairy heifers.

Oat mill feed in livestock rations, G. Bohstedt and A. W. Lathrop, in collab. with A. H. Walker and H. J. Deobald (*Wisconsin Sta. Bul. 441 (1938), pp. 55, figs. 10*).—A popular and less detailed report of the above research.

[The selenium content of Maine feeding stuffs], E. R. Tobey and B. E. Plummer, Jr. (*Maine Sta. Bul. 391 (1938), pp. 257, 258*).—Of the numerous samples of feeding stuffs analyzed, many gave entirely negative results for selenium and none contained in excess of 2 p. p. m. of this element.

Nutritive value of pasture, XII–XIV (*Jour. Agr. Sci. [England], 28 (1938), No. 4, pp. 581–608*).—The following reports were made on this series of studies (E. S. R., 73, p. 665):

XII. *The influence of cutting at monthly intervals over nine seasons on the quality and productivity of a heavy-land pasture*, H. E. Woodman and R. E. Evans.—A series of variously fertilized permanent pasture plats, located on heavy clay soil and each receiving an annual fall application of farmyard manure, was included in this study. Monthly clipping of these pastures over a period of 9 yr. did not result in any deterioration of productivity or a decline in quality of the grass, as judged by both chemical and botanical composition.

XIII. *An inquiry into the residual effects of the intensive use of sulphate of ammonia on pastures*, H. E. Woodman and R. E. Evans.—Certain plats in the above-described experiment received periodic applications of sulfate of ammonia for the first 5 yr. of the test, after which this treatment was discontinued and its residual effect determined in the following years. It appeared that the artificial stimulation of growth over a period of years by the use of sulfate of ammonia had reduced the inherent vigor of the grasses so that when the stimulus was discontinued they were unable to grow as rapidly as grasses which had not received this stimulation. These plats showed complete recovery from this effect 3 yr. after such fertilization was discontinued.

XIV. *The influence on yield and composition of a single heavy dressing of sulphate of ammonia compared with that of periodic small dressings throughout the season*, H. E. Woodman, R. E. Evans, and P. M. Oosthuizen.—Experimental evidence was obtained to indicate that the application of sulfate of ammonia in three or more periodic small dressings throughout the season offered distinct advantages over a single heavy application in the early spring. The former method eliminated the possibility of scorching, which often resulted from the latter practice, and maintained a more uniform supply of grass throughout the season.

The comparative values for eight protein supplements in winter rations for stock cattle, C. W. McCampbell and L. C. Aicher (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1937–38, pp. 8*).—Continuing these investigations (E. S. R., 78, p. 836), results are reported for the 1937–38 trials with calves and with yearlings, and the results of three trials with calves are summarized. This year's results confirm previous findings in that lots of both calves and yearlings receiving 3 lb. of wheat bran per head daily as a supplement to sorgo silage made the most rapid and most economical gains, closely followed by the lots receiving 4 lb. of alfalfa hay. These lots exceeded any of the groups receiving 1 lb. per head daily of a high protein concentrate. Of the six protein concentrates compared, corn gluten meal gave most rapid and economical gains in calves, both on the basis of the 1937–38 trial and the 3-yr. average, closely followed by the cottonseed meal group. With yearlings there was little difference in the gains produced by the different protein supplements, except in the case of peanut meal which produced considerably less gain.

The Mandan grazing trial, J. H. Shepperd (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 3, pp. 7–9*).—This article briefly reviews the results of 24 consecutive years of grazing trials with 2-year-old or yearling steers on North Dakota range pastures to determine the effect of rate of stocking the range on the daily gains of cattle, the quality of beef produced, and the quality and botanical composition of the pasture flora.

Nutritional studies with cattle on a grassland-type range in Arizona, E. B. Stanley (*Arizona Sta. Tech. Bul. 79 (1938), pp. 127–164, figs. 10*).—The investigations summarized in this bulletin extended from 1933 to 1937. Four range areas, each containing approximately 380 acres and cornering at a watering place, were used. During the first year each area was stocked with 18 cows and 17 calves, and in subsequent years 20 cows and their calves were carried on each. Throughout the trials the cows were rotated at regular intervals to minimize the effect of any differences in the amount or type of available forage. Earlier reports have dealt with the vitamin A content (E. S. R., 79, p. 230) and the chemical composition (E. S. R., 80, p. 83) of these range grasses.

The nutritive qualities of this grassland range were found adequate for the yearlong maintenance of these cattle breeding units. Two years' results indicated that calcium and phosphorus supplements were in no way beneficial. Five years' results gave evidence that the feeding of cottonseed cake as a winter supplement had relatively little effect on either the birth weight or weaning weight of the calves and was considered impractical except as an emergency feed. The average salt consumption of cows was 1.68 oz. per head daily, ranging from over 3 oz. in winter to less than 1 oz. in summer. The water consumption varied directly with air temperature and evaporation, but averaged 6.3 gal. per head daily. Preliminary studies indicated that creep feeding range calves was not a feasible practice. A study of the relation of birth weight and weaning weight of calves indicated that a 10-lb. weight advantage at birth was indicative of a 46-lb. advantage at 200 days of age. Substantial progress was attained in increasing

the average size of cows and calves during the course of this investigation, attributable to the use of good type bulls and improved management practices.

An apparatus and technique for measuring the respiratory exchange of fed sheep over periods of forty-eight hours, E. W. L. Lines (*Jour. Agr. Sci. [England], 28 (1938), No. 4, pp. 663–678, figs. 4*).—This report from the University of Adelaide presents a full description and constructional details for a respiration chamber, gas sampling and collecting devices, and modifications in the structure and operation of the Haldane-Carpenter gas analysis apparatus. This apparatus automatically compensates for diurnal changes in temperature and humidity and maintains a constant rate of ventilation. Methods for computing the energy metabolism and respiratory quotient from the gaseous exchange and methane production are fully described. Measurement of the gaseous exchange of sheep with this equipment gave good agreement with the energy absorbed from a maintenance diet.

Identification and measurement of the combustible gases that occur in the gaseous metabolic products of sheep, J. W. H. Lugg (*Jour. Agr. Sci. [England], 28 (1938), No. 4, pp. 688–694, fig. 1*).—This further report from the above research institution describes an apparatus for the estimation of combustible gases in the gaseous metabolic products of sheep. Preliminary trials with sheep gave an average ratio of hydrogen to carbon atoms in the combustible gases of 1:3.999, indicating that the gas is extremely pure methane. The heat of combustion of the methane produced was about one-eighth of the difference between the heat of combustion of the intake and that of the feces plus urine, which is in reasonable agreement with earlier published results for ruminants.

Relative efficiency for growing lambs of the protein in rations containing alfalfa hay, timothy hay, and combinations of the two hays, J. I. Miller and F. B. Morrison. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 2, pp. 149–155*).—A series of nitrogen-balance experiments was conducted with growing lambs to determine the digestibility and utilization of the following rations: (1) Corn and alfalfa hay, (2) corn and a mixture of alfalfa and timothy 2:1, (3) corn, soybean oil meal, and a mixture of alfalfa and timothy 1:2 and (4) corn, soybean oil meal, and timothy. The roughages comprised 50 percent by weight of the ration, and the other ingredients were so adjusted as to provide the same energy, mineral, and protein (10 percent) intake levels in each case. The average percentage of total protein stored was 17, 20.2, 23.7, and 21.3, and the estimated biological value of the protein was 59, 60, 64, and 62 for rations 1, 2, 3, and 4, respectively. The only statistically significant differences in values existed between rations 1 and 3. Apparently a ration of corn and timothy, when properly supplemented, furnished protein of as high efficiency for lambs as rations of corn and alfalfa.

Overeating by fattening lambs is serious problem of feeding industry in Colorado, I. E. Newsom (*Colo. Farm Bul. [Colorado Sta.], 1 (1939), No. 1, pp. 4, 5*).—The prevalence of disorders and death of grain-fed lambs due to overeating is discussed. The need for introducing more roughages into the fattening ration and carefully regulating the grain intake in order to prevent such disorders is stressed.

A study of the development of the characters of the fleece during growth in the different regions of the body, L. F. Thomasset (*Jour Agr. Sci. [England], 28 (1938), No. 4, pp. 523–540, pls. 4, figs. 5*).—In a study of twin lambs of a Suffolk × Suffolk (Border Leicester × Cheviot) cross, the fleece of the different body regions developed in the following order—shoulder, leg, belly, and tail. Color of fibers, the amount of medullated fibers, fineness of fibers, and uniformity of fiber size were considered. Any tendency toward wool improve-

ment within a breed was first expressed by changes in the earliest developing region and last in the latest developing region. An improved animal is considered as one in which the latest developing part of the fleece has the least possible number of undesirable fibers at the earliest possible age. It appeared that examination of the fleeces of lambs, particularly in the late-developing areas, would reveal defects and give some idea of the genetic constitution which would be concealed in an adult animal.

A normal growth curve for swine, N. R. Ittner and E. H. Hughes. (Univ. Calif.). (*Jour. Heredity, 29 (1938), No. 10, pp. 385, 386, fig. 1*).—A growth curve based on the average rate of growth of 457 pigs from 3.2 lb. at birth to 182.5 lb. at 196 days of age is presented. The curve showed a gradual acceleration until the pigs were about 6 mo. of age (160 lb. in weight), after which the rate of gain began to decline.

Bibliography of poultry publications (*U. S. Dept. Agr., 1938, pp. [1]+76*).—This compilation, by the Departmental Poultry Committee, of references on poultry subjects includes Department publications, popular and scientific articles, and published addresses by employees of the Department.

Variability of body temperature in the normal chick, W. F. Lamoreux and F. B. Hutt. (Cornell Univ.). (*Poultry Sci., 18 (1939), No. 1, pp. 70–75, figs. 3*).—A pronounced rise occurred in the body temperature of chicks during the first week after hatching, particularly during the first 4 days, although no significant differences were noted between average temperatures at 4 and 5 days of age. White Leghorns had a significantly higher body temperature than Rhode Island Reds at 7 to 10 days of age. No consistent relationships were found between temperature and sex or temperature and body weight. Diurnal variations, temperature gradient, and differences in the ability of the attendants to record temperatures were other major causes of variation. The necessity of carefully standardized technics for recording temperature and caution in comparing results from the different experiments are stressed.

The utilization of food elements by growing chicks.—VI, The influence of the protein level of the ration on the growth of chicks, C. W. Ackerson, M. J. Blish, and F. E. Mussehl (*Nebraska Sta. Res. Bul. 108 (1939), pp. 12, figs. 2*).—Continuing this series of studies (E. S. R., 79, p. 525), two rations containing 16 and 22 percent of protein, respectively, were fed to newly hatched chicks in two series of feeding trials. The chicks fed the 22 percent protein ration made greater gains on the same dry matter intake over the same period of time and showed a higher percentage of nitrogen in the gain than those receiving the 16 percent ration. However, chicks on the 16 percent level showed a higher ratio of gain in weight to nitrogen fed and retained a higher percentage of nitrogen fed. Only slight differences occurred in the percentage retention of calcium and phosphorus. The dilution of the 22 percent protein basal ration with 30 percent of starch to give a 16 percent ration resulted in uniform and definite evidence of depraved appetite, including feather picking and coprophagy, and also gave poor feathering.

Comparative values of various protein feeds for growing chicks, R. M. Sherwood and J. R. Couch (*Texas Sta. Bul. 569 (1939), pp. 27*).—Five experiments, each with six lots of chicks, were conducted to determine the relative value of various combinations of protein-rich feeds, as measured by average live weight gains, feed requirement per unit of gain, and percentage mortality. Protein concentrates included sardine meal, dried skim milk, meat and bone scraps, cottonseed meal, and soybean oil meal, three of these feeds being used in combination in each of the nine rations tested. In practically all cases, rations containing sardine meal, regardless of other constituents, produced larger gains

and required less feed per unit of gain than rations not containing this ingredient. However, the sardine meal rations resulted in slightly higher mortality than when this ingredient was omitted, except in the case of the sardine meal-skim milk powder-soybean oil meal combination. Excessive mortality resulted when sardine meal was fed in combination with meat and bone scraps and soybean oil meal, but this high mortality did not occur when cottonseed meal replaced soybean oil meal in the mixture. In practically all cases, soybean oil meal and cottonseed could be used interchangeably and also dried skim milk and meat and bone scraps could be interchanged without appreciably affecting results. It appeared that, with the exception of the sardine meal-meat and bone scraps-soybean oil meal mixture, any of the combinations tested could be recommended to give satisfactory results, and that availability and cost per hundredweight should determine which one to use.

Vitamin "A" requirements of growing chicks: A review of experimental work, A. E. Tepper and R. C. Durgin (*New Hampshire Sta. Bul. 310 (1938), pp. 23, figs. 6*).—Experimental results obtained over a 6-yr. period are summarized. The various objectives in this series of investigations included the effect of various levels of cod-liver oil for growing chicks, the effect of changing chicks from an adequate vitamin A ration to a deficient vitamin A ration at an early age, the effect of increasing cod-liver oil levels as chicks advanced in age, the relative value of the New England College Conference ration with and without cod-liver oil, the vitamin A potency of sardine oil and the relative efficiency of sardine and cod-liver oils, and the optimum number of vitamin A units required by growing chicks to 6 weeks of age.

The chicks showed a relatively high requirement for vitamin A for rapid growth and normal storage, amounting to approximately 135 International Units per 100 gm. of feed during the first 5 weeks and, thereafter, increasing to approximately 400 I. U. per 100 gm. of feed. When chicks were changed from a vitamin A-adequate to a deficient diet at 4 or 8 weeks of age, the stored vitamin A was not sufficient to meet their requirements for more than 2 weeks of deficiency feeding. Kidney injury and the presence of urinary crystals in the feces and scrapings from the large intestine accompanied vitaminosis A. An increased vitamin A consumption increased feed consumption, but too high a content of cod-liver oil in the feed tended to decrease livability of the chicks. Adding ½ or 1 percent of either cod-liver oil or sardine oil to a vitamin A-deficient basal diet prevented the occurrence of vitaminosis A, with the cod-liver oil groups showing somewhat more rapid growth. Increasing the level of vitamin A intake beyond that supplied by 1 percent of good cod-liver oil was not warranted. The New England College Conference ration contained sufficient vitamin A to prevent ophthalmia and to support normal growth without additional vitamin A supplement.

Effectiveness of chondroitin in preventing gizzard erosion in chicks, H. R. Bird, J. J. Oleson, C. A. Elvehjem, and E. B. Hart. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 126 (1938), No. 2, pp. 671–678*).—This is a more detailed report of research previously noted (E. S. R., 80, p. 242).

The effect of riboflavin on the incidence of curled toe paralysis in chicks, E. L. R. Stokstad and P. D. V. Manning (*Jour. Nutr., 16 (1938), No. 3, pp. 279–283*).—In a series of experiments chicks were depleted for 2 weeks on a riboflavin-free diet and then fed graded amounts of riboflavin for 2- or 6-week test periods. Under these conditions chicks which were continued on a basal diet did not develop curled toe paralysis. With additions of suboptimal amounts of riboflavin this disorder developed in a high percentage of cases, but larger amounts of riboflavin, adequate to support normal growth, completely prevented it.

[Batteries for chicks, broilers, and laying hens] (*Oregon Sta. Circ. 130 (1938), p. 43*).—Results of comparative tests are noted.

Effect of rearing environment on sexual development of fowls, E. W. CALLENBACH and J. E. NICHOLAS (*Pennsylvania Sta. Bul. 368 (1938), pp. [2]+9, figs. 4*).—This report substantiates findings (E. S. R., 78, p. 385) that (1) the temperature and relative humidity of the brooder house had no measurable effect on the sexual development of pullets, (2) heavy grain consumption by immature pullets did not retard sexual development, and (3) the use of electricity for brooder heat, employing exposed, black-heat resistant coils, resulted in a slower rate of sexual maturity of pullets than comparable birds exposed to other sources of brooder heat.

Egg composition.—I, The effect of diet and storage on the chemical composition of eggs, R. REDER. (Okla. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 1, pp. 19–25*).—Six groups of White Leghorn pullets were fed diets of varying composition, three groups receiving all-mash rations containing 13, 16, and 25 percent protein, respectively, and the three remaining groups receiving mash and grain rations of varying composition and constituents. Composite samples of eggs from each group were analyzed while fresh and after storage periods of from 9 to 236 days. No significant differences were found in the composition of the fresh eggs produced on the different diets, and the changes in composition which occurred during storage were practically the same for all groups. In general, the moisture content of the yolks increased and that of the whites decreased during storage. The loss in total egg weight during storage was greatest in eggs produced on the high protein diet.

Turkey production, T. T. MILBY, R. G. JAAP, and R. B. THOMPSON (*Oklahoma Sta. Bul. 236 (1939), pp. 38, figs. 17*).—A handbook on turkey production, including discussions of the selection and care of breeders, the construction of trap nests, incubation, brooding, the feeding and management of poults and growing turkeys, finishing, disease prevention and treatment, and marketing of turkeys.

Common laying rations without supplement may not be sufficient for breeder turkeys, H. S. WILGUS, JR. (*Colo. Farm Bul.* [*Colorado Sta.*], *1 (1939), No. 1, pp. 16–18*).—Preliminary results of a study to determine the vitamin G requirements of breeding turkeys necessary to give optimum hatchability of eggs indicated that an ordinary poultry laying ration without milk was deficient in this factor and that hatchability was markedly improved by adding 2.5 or 5 percent of dried whey to the ration. Poorer results were obtained in a second trial than in the first, indicating that rations may vary from season to season and that under certain conditions 5 percent of dried whey fails to provide an adequate level of vitamin G. Similar results were obtained with pens of layers in confinement and on range. Electric lights to provide a 14-hr. day proved effective in stimulating early egg production.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Iowa] (*Iowa Sta. Rpt. 1938, pt. 1, pp. 89–91, 124–134*).—Progress reports (E. S. R., 79, p. 528) of experiments with dairy cattle, by C. Y. Cannon, B. H. Thomas, D. L. Espe, and E. N. Hansen, include the relation of vitamin E to sterility in dairy cattle, the influence of the physical properties of milk on its rate of digestion in vivo, the value of corn sugar in the grain ration of dairy calves, and a comparison of roughages and the relation of roughages to grain in dairy cow rations.

Reports of progress are presented for the following studies with dairy products: Micro-organisms causing surface taint in butter, the germicidal properties of milk, the classification of the organisms important in dairy products, the development of butter cultures from mixtures of organisms, methods of preparing butter cultures for mail shipment, and the importance of acteylmethylcarbinol and diacetyl in butter cultures, all by B. W. Hammer; the nitrogen metabolism of *Lactobacillus casei* cultures, and the fat and protein metabolism of *Penicillium roqueforti*, both by C. B. Lane and Hammer; the production of 2,3-butylene glycol in dairy products, by Hammer and C. H. Werkman; kinds of acids and their distribution in butter, and the effects of neutralizers on fat losses in buttermilk and on the quality of butter, both by E. W. Bird; sediment tests for cream and butter, by M. Mortensen and Bird; and the manufacture of a special-type Swiss cheese, and the standardization of Iowa dairy products, both by E. F. Goss and Mortensen.

[Investigations with dairy cattle and dairy products by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1938, pp. 86, 87, 90, 91–95, 103–106, 109*).—Brief reports are presented for the following lines of investigation, by G. W. Salisbury, F. B. Morrison, E. S. Savage, E. S. Harrison, O. L. Lepard, R. B. Ace, W. C. Hurley, P. E. Newman, R. A. Rasmussen, R. Bogart, L. A. Maynard, C. M. McCay, K. E. Gardner, and H. Paul. The influence of the quality of the protein in the concentrate mixture on the production of dairy cows fed mixed hay and corn silage, the use of molasses or phosphoric acid in making silage from legumes and grasses, the effect of quality and variety of hay upon dairy heifers, the use of yeast in calf starters, the value of dried molasses-and-yeast byproduct for dairy calves, the ascorbic acid content of the milk of various species of animals, and studies on the physiology of lactation.

From investigations with dairy products, by P. F. Sharp, B. L. Herrington, D. B. Hand, V. N. Krukovsky, E. S. Guthrie, J. M. Sherman, C. N. Stark, and I. C. Gunsalus, results are noted for factors involved in the lipolytic activity of milk, factors affecting the vitamins in milk, various factors involved in the processing of milk, the utilization of milk sugar, factors influencing the physical state of milk fat, and numerous studies in the bacteriology of milk.

[Investigations with dairy cattle and dairy products in Oklahoma] (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. 7–14, 65–74, figs. 3*).—Studies for which results are reported include the effect of continuous use of purebred sires on the average milk production of dairy herds, and the effect of methods of watering on growth of calves, both by P. C. McGilliard, E. Weaver, and A. H. Kuhlman; the vitamin A requirements of dairy cattle and the prevention of "cottonseed meal injury" by feeding adequate amounts of vitamin A, by Kuhlman, Weaver, and W. D. Gallup; the composition and nutritive value of mung bean silage, by Kuhlman, McGilliard, Weaver, and Gallup; and the effect of feeds on the quality of butterfat, the vitamin A potency of prairie hay, and the effect of season on the carotene content of hays, all by Gallup.

Studies with dairy products, by E. L. Fouts, J. I. Keith, W. V. Maddox, and Weaver, include the effect of cooling cream on the quality of butter, the use of oat flour in preventing rancidity in butter, copper as a causative factor of oxidized flavor in ice cream, factors causing sandiness in ice cream, and the common causes of off-flavors in milk.

[Dairy cattle investigations in Oregon] (*Oregon Sta. Circ. 130 (1938), pp. 28, 29, figs. 3*).—Preliminary findings regarding the effect of vitamin A, vitamin E, and phosphorus deficiencies on the reproduction of dairy cattle and the deficiencies of alfalfa hay as the sole roughage for milking cows are briefly discussed.

[Experiments with dairy cattle and dairy products in Pennsylvania] (*Pennsylvania Sta. Bul. 367 (1938), pp. 6, 10, 36–38, 39–43, figs. 2*).—Results are briefly noted for the following studies: Vitamin D storage in calves, by R. A. Dutcher and N. B. Guerrant; the effect of fertilization on the returns secured from permanent pastures, by S. I. Bechdel and C. F. Noll (coop. U. S. D. A.); the carotene requirements of dairy calves, by Bechdel and Guerrant; methods of making alfalfa-molasses silage and its feeding value for heifers and for milking cows, by Bechdel and P. S. Williams; and the carotene content of dehydrated alfalfa and alfalfa-molasses silage, by Bechdel.

Studies with dairy products reported include methods of preventing flavor defects in milk and its products, by C. D. Dahle; the effects of the ration on milk color, by W. D. Swope; the comparative digestibility of soft-curd and hard-curd milks, low pressure homogenization of milk and cream, changes occurring in concentrated frozen milks, and the use of the phosphatase test for determining the efficiency of pasteurization, all by F. J. Doan; the bacteriological changes occurring during the curing of cheese, by Dahle, T. G. Anderson, and H. O. Triebold; and the detection of the coli-aerogenes group in milk, metabolic studies of the streptococci, and a comparison of various media for making bacteriological counts of milk, all by M. A. Farrell.

[Dairy cattle investigations in South Carolina] (*South Carolina Sta. Rpt. 1938, pp. 77–81, fig. 1*).—Brief progress reports are presented for the following studies, by J. P. LaMaster and G. H. Wise: The preservation and feeding value of various types of silage, the effects of changing milking cows from a silage ration to pasture and vice versa, a rotational system of grazing permanent grass pastures, and a comparison of the open-pail *v.* the nipple-pail method of feeding milk to calves.

[Investigations with dairy cattle and dairy products in Texas] (*Texas Sta. Rpt. 1937, pp. 135, 136, 137, 173*).—Results are briefly noted on the quantitative requirements of vitamin A for dairy cattle, by O. C. Copeland, G. S. Fraps, and A. R. Kemmerer; cottonseed meal and hulls as a ration for milking cows, by Copeland; effective management practices for eradicating infectious abortion from dairy herds, by H. Schmidt, Copeland, and R. D. Turk; mineral requirements, by P. R. Johnson; and factors affecting the quality of southern short-cure Cheddar cheese, and methods of manufacture and other factors affecting the quality of butter, both by F. E. Hanson and C. N. Shepardson.

[Investigations with dairy products in Wisconsin] (*Wisconsin Sta. Bul. 442 (1938), pp. 67–76, fig. 1*).—Results are briefly reported for the following studies: The effect of time and temperature of incubation on Swiss cheese starters, by H. J. Peppler and W. C. Frazier; the bacteriology of Swiss cheese, by J. C. Garey, Frazier, and C. C. Schmiege; controlling the quality of brick cheese starters, by W. L. Langhus, P. R. Elliker, and W. V. Price; factors causing splitting of brick cheese, by F. E. Hanson, D. W. Spicer, and Price; a method of predicting acidity of brick cheese, by Price and Spicer; an improved method of measuring the salt content in butter and ways of improving uniformity of physical properties of butter, both by K. G. Weckel; factors involved in activated flavor in milk, by J. C. Flake, Weckel, and H. C. Jackson; the temperature of separation as related to lipase activity in cream, by J. C. Pfeffer et al.; constituents of milk involved in oxidized flavor development, by A. M. Swanson and H. H. Sommer; and improved methods for irradiation of milk, by H. H. Beck et al.

Urea as a protein substitute in the diet of young cattle, S. Bartlett and A. G. Cotton (*Jour. Dairy Res. [London], 9 (1938), No. 3, pp. 263–272, fig. 1*).—In the experiment described, groups of dairy heifers ranging in age from 7

to 17 mo. were fed rations of normal protein content, low protein, and low protein supplemented with urea for 142-day experimental periods. The addition of 0.127 lb. of urea per animal daily resulted in a significantly greater average daily gain than for heifers on the unsupplemented low protein diet, indicating that the animals utilized the urea nitrogen in their metabolism. Animals receiving the same amount of supplemental nitrogen in the form of protein made slightly better growth than those receiving urea.

A study of the effect of feeding oils to dairy cows and of the value of the Latin square lay-out in animal experimentation, F. H. Garner and H. G. Sanders (*Jour. Agr. Sci. [England], 28 (1938), No. 4, pp. 541–555, figs. 2*).—In these studies at the University of Cambridge a Latin square technic was employed, using 4 cows with 4 levels of fat feeding. In all, 14 experiments with unit periods of 5 days, 2 with 10-day periods, and 1 with a 20-day period, were conducted. Of the fats tested, palm oil, butter, lard, and possibly cottonseed oil increased the fat yield of the cows, chiefly by raising the butterfat content of the milk. Soybean, linseed, and whale oils were without effect, and cod-liver oil definitely decreased the fat content of the milk and total butterfat yield. The results indicated that beneficial oils are those containing a large proportion of saturated fatty acids. This experimental technic proved very efficient, experimental errors being generally lower than those usually obtained in experiments with field crops.

Phosphorus deficiency among cattle in Pennsylvania, E. B. Forbes and S. R. Johnson (*Pennsylvania Sta. Bul. 371 (1939), pp. 25, figs. 20*).—Numerous cases of phosphorus deficiency in cattle are described and illustrated, along with a description of the existing feeding conditions in each instance. This survey led to the conclusion that definite phosphorus deficiency of cattle in the State is a rare disorder and is likely to occur only when animals are wintered largely or exclusively on the less nutritive roughages, such as cereal straw and corn stover, without adequate allowance of grain or other concentrate feed. Preventing normal access to sunshine serves to aggravate the effect of phosphorus deficiency. It may be found in cattle of either sex at any age, but is most likely to occur in heavy milking cows. Good feeding and management practices are recommended as the best preventive of this disorder. Bonemeal is recommended in cases where a concentrated phosphatic supplement is required.

On alimentary acetonuria and ketonuria in dairy cattle induced by feeding grass silage of the butyric acid type, E. Brouwer and N. D. Dijkstra (*Jour. Agr. Sci. [England], 28 (1938), No. 4, pp. 695–700*).—When a group of cows was fed grass silage containing approximately 2 percent butyric acid, the urine consistently gave a positive test for acetone and was relatively high in ketone bodies and ammonia, whereas in a control group receiving hay the urine was negative for acetone and much lower in ketone bodies and ammonia. When the rations of the two groups were reversed the characteristics of the urine were promptly reversed, indicating that the acetonuria was of nutritional origin, probably due to the incomplete oxidation of the butyric acid of the grass silage. The reaction of the urine remained alkaline and the ammonia content was within a normal range, showing that there was no real acidosis. Clinically the cows receiving silage never appeared to be ill.

The practical application of age conversion factors to dairy cattle production (butterfat) records, A. H. Ward and J. T. Campbell (*Jour. Agr. Sci. [England], 28 (1938), No. 4, pp. 509–522*).—An analysis of the records of 702 Jersey cows which had been tested for at least 6 consecutive years in the New Zealand Co-operative Herd Testing Association led to the conclusion

that increases in milk and butterfat production with advancing age cannot be accurately estimated either by a percentage addition to immature records or by a constant addition. The increase can best be represented by a regression formula of the nature $X=aY+b$, where X equals the mature production and Y the immature production.

Breeding for high production, J. R. Dice (*North Dakota Sta. Bimo. Bul.*, *1 (1939), No. 3, pp. 28–30*).—The value of using dairy sires capable of transmitting the factors for high milk and butterfat production is discussed. Methods of evaluating dairy sires on the basis of their progeny performance are outlined.

Relation between conformation and anatomy of cows of unknown producing ability, W. W. Swett and R. R. Graves. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 3, pp. 199–235, fig. 1*).—Body measurements and postmortem anatomical data were obtained on a large group of cows, of unknown history but showing definite dairy breed characteristics, which were slaughtered in a commercial packing plant. Much wider variations were found to occur in the weights and measurements of the internal organs than in the external body measurements. Live weight was highly correlated with body bulk and many of the individual body measurements, particularly with chest circumference or heart girth. The weights of the heart and liver were the only internal items highly correlated with live weight. The correlations of various items with body widths were generally definitely lower than corresponding ones for body depths, the differences being most marked at the fore chest and progressively less at the rear chest and paunch. Heart weight was moderately correlated with depth of chest and depth, length, and volume of the thoracic capacity, but showed low correlation with width of body, width of thoracic cavity, breadth and length of body, and with other internal organs except the liver. Correlations for lung weight were generally lower than for heart weight. The length of the intestines generally showed a low magnitude of correlation with other items. Certain breed differences are discussed.

Growth and development, with special reference to domestic animals.—L, The influence of fasting and refeeding on milk production, heat production, and respiratory quotient, L. E. Washburn, S. Brody, and A. C. Ragsdale (*Missouri Sta. Res. Bul. 295 (1939), pp. 24, figs. 8*).—This series of studies has been continued (E. S. R., 80, p. 245). The data summarized include one lactating cow and one dry dairy cow and two lactating and two dry goats, in addition to data for rats previously described (E. S. R., 79, p. 374). Time curves are presented for the absolute and relative milk production, milk composition, heat production, respiratory quotient, and methane production during advancing fasting and on refeeding for these three species. The heat production of lactating animals was consistently much higher than for nonlactating animals. With all three species there was a parallel decline in the percentage milk production, heat production, and respiratory quotient with advancing fasting, and parallel increases on refeeding. It is concluded that it is not possible either with ruminants or rats to determine the basal heat production during normal lactation because normal lactation appears to be incompatible with the postabsorptive state.

The influence of various fodder supplements on the production and the nutritive value of winter milk, S. Bartlett, A. G. Cotton, K. M. Henry, and S. K. Kon (*Jour. Dairy Res. [London], 9 (1938), No. 3, pp. 273–309, figs. 8*).—In the experiment noted four groups of cows, at the National Institute for Research in Dairying, without access to green feed received typical winter rations supplemented with mangels (control group), artificially dried grass,

sprouted corn, and kale, respectively. Over an 11-week experimental period no significant differences were found between any of the supplements in their effect on the yield of milk or the fat and solids-not-fat content of the milk. The addition of kale or artificially dried grass materially increased the carotene and vitamin A content of the milk, while sprouted corn gave results similar to mangels in this respet. There was no significant difference in the vitamin B complex contained in milk produced on the mangels, dried grass, and sprouted corn rations. The vitamin B_2 (complex) in milk was varied, but averaged lowest on the sprouted corn ration. The vitamin C content of milk was highest on the sprouted corn ration, followed in order by the kale, mangels, and dried grass milks.

Four series of rat feeding tests were conducted to compare the nutritive value of these milks. The milks were fed supplemented with minerals alone or with minerals and sugar, each ration being fed ad libitum and on an equalized intake basis. No differences were found in the growth-promoting properties of the different milks, leading to the conclusion that under the conditions of this experiment the technic failed to reveal the presence of a new essential dietary factor. Probable reasons for differences in these findings and those reported by the Wisconsin Experiment Station (E. S. R., 78, p. 527) are discussed at length.

Studies on the blood precursors of milk protein, E. P. REINEKE, V. E. PETERSON, O. B. HOUCHIN, and C. W. TURNER (*Missouri Sta. Res. Bul. 296 (1939), pp. 20*).—Continuing this line of investigation (E. S. R., 78, p. 689), a comparison of simultaneously drawn arterial and venous blood samples from lactating goats showed that the amino acids absorbed by the mammary glands were insufficient to account for the nitrogen content in the milk. The absorption of amino acid nitrogen by the gland averaged about 0.7 mg. per 100 cc. of plasma. The mammary gland caused considerable shifting of the increments of globulin from one fraction to another, but the uptake of globulin was not constant for any specific fraction. It was found that the gland may absorb fibrinogen, globulin, or albumin from the blood stream, with a return to the venous blood of one or more of these substances. This suggests that these proteins may undergo a reversible series of transformations in the mammary gland from albumin to globulin to fibrin. Arterio-venous differences frequently showed the mammary gland to be in negative nitrogen balance, and variations in the nitrogen content of samples from moment to moment were great enough to mask sometimes the amount of nitrogen actually involved in milk secretion.

The composition of the blood and milk of lactating cows during inanition, with a note on an unidentified constituent present in certain samples of abnormal milk, J. A. B. SMITH, G. R. HOWAT, and S. C. RAY (*Jour. Dairy Res. [London], 9 (1938), No. 3, pp. 310–322*).—The yield and composition of milk secreted by cows and the composition of their blood during a 12-day fast were determined and compared with the values secured during the prefast and postfast periods. Milk yields dropped rapidly during the fasting period, although the three animals varied somewhat in this respect. The protein content of the milk rose considerably so that there was an increase of approximately 20 percent by the ninth day of fast, and these high values persisted for several days after feeding was resumed. The percentage of fat rose sharply, reaching values of from two to three times normal. However, the total yield of fat showed a daily decline throughout the period of fasting. When the simple starvation was unaccompanied by milk fever or other complications, the lactose content and the chloride : lactose ratio varied only slightly from normal. An unidentified

constituent appeared in the milk during fast, which in some cases amounted to about 2 percent of the milk or nearly 20 percent of the solids-not-fat. The phosphatase content of the milk increased markedly, while only slight and inconsistent variations in blood phosphatase occurred. Blood sugar and the blood corpuscle volume tended to rise slightly, and blood chloride levels declined during inanition.

The diffusion of trimethylamine oxide from the udder, W. L. Davies (*Jour. Dairy Res.* [*London*], *9* (*1938*), *No. 3*, *pp. 323–326*).—Continuing this line of investigation (E. S. R., 76, p. 236), a neutral solution of pure trimethylamine oxide was injected into two quarters of a lactating udder. These quarters increased in turgidity up to 2.5 hr. after injection and then relaxed. The oxide diffused rapidly out of the quarters from 3 to 4 hr. after injection, and a maximum concentration appeared in the urine by the end of the third hour. Within a period of 8.3 hr. after injection, 76 percent of the diffusible oxide was recovered in the urine, milk obtained 7 hr. after injection containing from 7 to 8 mg. percent of the tertiary nitrogen.

The chloride content of milk, W. L. Davies (*Jour. Dairy Res.* [*London*], *9* (*1938*), *No. 3*, *pp. 327–335*, *figs. 3*).—The magnitude and frequency of variations in the chloride content of 7,802 samples of milk are reported. The mode of morning samples of all breeds was from 81 to 90 mg. percent and of evening samples from 71 to 80. The mode for Guernseys and Shorthorn milks was from 71 to 80 and for all other samples from 81 to 90. The averages for Shorthorn, Guernsey, the institute herd, all samples, special Friesian milk of low solids-not-fat content, and the bulk institute milk were 97, 93, 93, 98, 128, and 85 mg. percent, respectively. The influence of other factors, such as breed, age, lactation period, number of lactations, season, and udder troubles, is discussed.

The methylene blue reduction test and the keeping quality of milk, C. H. Chalmers (*Jour. Dairy Res.* [*London*], *9* (*1938*), *No. 3*, *pp. 351–355*).—A study was made of the relationship between reduction time and keeping quality of milks held for 1, 7, 16, and 23 hr. at 15° C. before testing. The following coefficients of correlation were obtained—at 23 hr. 0.954±0.004, at 16 hr. 0.893±0.015, at 7 hr. 0.66±0.055, and at 1 hr. 0.442±0.059. Apparently examining milk by the methylene blue reduction test within a few hours after it is produced gives a very misleading indication of its keeping quality.

Improving milk color, H. H. Tucker. (N. J. Expt. Stas.). (*Guernsey Breeders' Jour.*, *55* (*1939*), *No. 4*, *pp. 279, 281, 282*).—A mixture of fresh carrots and tops and green corn in the proportion of 1:3 was ensiled without preservatives. In feeding trials, a group of four Guernseys and two Holsteins were fed a ration of grain, beet pulp, and hay for a 3-week preliminary period, followed by two successive 3-week periods in which the carrot-corn silage replaced the beet pulp in the ration. A second comparable group was similarly fed except that the beet pulp ration replaced the carrot-corn silage ration during the third experimental period. The carrot-corn silage proved very palatable. No significant differences were noted in average yield of milk or fat content of the milk for the two groups. An increase in the color of the milk occurred in each group during the first period on the carrot-corn silage, and a further increase in milk color occurred in group 1 during the second period on this ration, while in group 2 the milk promptly declined to approximately the original level when beet pulp replaced the carrot-corn silage. The carrot-corn silage increased th[illegible] degree in cows producing low-color milk tha[illegible]k.

Physical state [illegible], H. E. Ross. (Cornell Univ.). (*Milk Pla*[illegible]).—Numerous samples of

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milk were each divided into two equal lots, one of which was cooled to 50° F. and held at that temperature for 30 min. The other was held at a temperature of 115° for 30 min., after which time both lots of milk were adjusted to a temperature of 85° and run through the same separator. In practically all cases a greater loss of fat in the skim milk occurred in the samples held at the lower temperature, the average loss in these lots being 0.028 percent greater than in the samples held at the higher temperatures. Apparently the physical condition of the fat was the controlling factor in such losses.

The pasteurization of milk, C. J. Babcock (*U. S. Dept. Agr. Leaflet 177 (1939), pp. 4*).—The status of pasteurization, facts concerning pasteurized milk, and methods for home pasteurization are briefly discussed.

[A study of the crumbly butter problem in Oregon] (*Oregon Sta. Circ. 130 (1938), pp. 32, 33, figs. 4*).—A study of the chemical and physical properties of butterfat produced in the alfalfa sections of eastern and southern Oregon showed marked seasonal changes in the fat, that produced during the winter season when large quantities of alfalfa were fed tending to be hard while that produced in other seasons was relatively soft. Preliminary findings indicated that certain variations in the feeding program and in the butter manufacturing process gave some improvement in the body and texture of the butter.

An apparatus for measuring the elastic and plastic properties of cheese curd, G. W. Scott Blair (*Jour. Dairy Res. [London], 9 (1938), No. 3, pp. 347–350, fig. 1*).—The apparatus described has proved effective for measuring the elastic and plastic deformations of cheese curd under a compressive load at the time it is ready for cutting. A figure inversely proportional to shear modulus was obtained with considerable accuracy, and is a good criterion of firmness for indicating the optimum time to cut the curd.

The solubility of Cheddar cheese curd in sodium chloride solutions, F. H. McDowall and L. A. Whelan (*Jour. Dairy Res. [London], 9 (1938), No. 3, pp. 339–341*).—It was found that the proteins of cheese were approximately 100 percent soluble in 3 and 10 percent solutions of sodium chloride within 7 days after manufacture and remained at this value throughout the life of the cheese, thus indicating that the effect of salt concentration on cheese quality is not attributable to variations in the solubility of the proteins in the brine.

The composition of cheese rinds, W. L. Davies (*Jour. Dairy Res. [London], 9 (1938), No. 3, pp. 342–346*).—The composition of the rinds of a number of English, Canadian, and New Zealand Cheddar cheeses and of three Stilton cheeses is reported. The rind of ripened Cheddars contained from 15 to 20 percent of moisture, while that of unripened Cheddars contained up to 27 percent. The rinds were lower in fat, higher in protein, and also higher in calcium and phosphorus and in calcium: phosphorus ratio than the interior of the cheeses. The fiber content of the rinds was negligible.

The organisms causing rusty spot in Cheddar cheese, R. S. Breed and C. S. Pederson. (N. Y. State Expt. Sta.). (*Jour. Bact., 36 (1938), No. 6, p. 667*).—A brief résumé.

Factors affecting the activity and heat resistance of Swiss cheese starter cultures.—I, Influence of time and temperature of incubation, P. R. Elliker and W. C. Frazier. (Univ. Wis.). (*Jour. Dairy Sci., 21 (1938), No. 12, pp. 801–813, figs. 2*).—Cultures of *Lactobacillus helveticus* and *Streptococcus thermophilus* were considered in these studies. When carried through numerous transfers at temperatures of 30°, 35°, 37°, 40°, and 42° C., cultures of the former incubated at 37° or 40° were more active following heat treatment than those at 30°, 35°, or 42°, while the latter showed greater heat resistance when grown at 30°, 35°, or 37° than 40° or 42°. The 37° cultures of the former were

more heat resistant than the 40° cultures after the first 12-hr. transfer, but after numerous transfers this situation was reversed, and the 40° culture did not lose this increased heat resistance by one transfer at lower temperature. The 37° cultures of the latter were consistently more heat resistant than the 40° cultures after numerous transfers. Cultures of *L. helveticus* incubated at 37° or 40° for from 12 to 16 hr. were far more heat resistant than cultures incubated at the same temperatures for from 7 to 8 hr., but no marked differences occurred in activity following heat treatment of *S. thermophilus* cultures incubated at 37° within a range of from 6 to 16 hr.

The influence of methods of handling thermoduric lactics on the heat resistance of subcultures, H. J. Peppler and W. C. Frazier. (Univ. Wis.). (*Jour. Bact., 36 (1938), No. 6, p. 658*).—Cultures of *Lactobacillus helveticus* and *Streptococcus thermophilus* were carried continuously at 37° C., being transferred at 12- and at 24-hr. intervals and also at 37° following varying holding periods at 20°. After each culture had been transferred at least 7 consecutive times, fresh cultures were heated for 30 min. at 60° and then incubated at 37° to determine the rate and amount of growth and the degree of acid development. All cultures of the former carried continuously at 37° were equal in growth and acid production following heat treatment. Cultures of the latter transferred at 12-hr. intervals at 37° excelled those transferred at 24-hr. intervals in rate of growth and acid production. Incubation of either organism at 20° for periods longer than 36 hr. markedly reduced their activity.

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[The life work of Theobald Smith] (*Med. Classics, 1 (1937), No. 5, pp. [1]+341-669, pls. [11], figs. 7*).—This brief contribution on the writings of T. Smith (E. S. R., 72, p. 289), with a bibliographical list of 224 titles and an index, reprints the report on Investigations into the Nature, Causation, and Prevention of Southern Cattle Fever, by T. Smith and F. L. Kilborne (pp. 372–578) (E. S. R., 5, p. 608), and A Comparative Study of Bovine Tubercle Bacilli and of Human Bacilli from Sputum, by T. Smith (pp. 599–669) (E. S. R., 10, p. 691).

[Work in animal pathology and parasitology by the Iowa Station] (*Iowa Sta. Rpt. 1938, pt. 1, pp. 97–99, 145, 150–153*).—The work of the year reported (E. S. R., 79, p. 534) includes the etiology of range paralysis in poultry and the egg as a possible mode of its transmission in chickens, both by C. Murray, C. D. Lee, and H. L. Wilcke; the effect of dietary constituents on coccidiosis in domestic fowl, by Becker and Wilcke; breeding for resistance to fowl typhoid in poultry, by E. W. Lindstrom, J. W. Gowen, and N. F. Waters; and genetic investigation of resistance and susceptibility of typhoidlike diseases in laboratory animals, by Lindstrom and Gowen.

[Research work in animal pathology by the Oregon Station] (*Oregon Sta. Circ. 130 (1939), pp. 8, 9, 42, 43, figs. 9*).—Brief reference is made in this preliminary report of research work to the causes of four range diseases of sheep, namely, lunger disease, stiff lambs, lamb dysentery, and pregnancy disease, and to poultry diseases, including laryngotracheitis, coccidiosis, pullorum disease, neoplastic disease, and diseases of the turkey.

[Work in animal pathology and parasitology by the South Carolina Station] (*South Carolina Sta. Rpt. 1938, pp. 75, 76, 81, 98, 99*).—The work of the year reported (E. S. R., 79, p. 390) relates to a study of the effect of kidney worms upon the growth of swine, by G. W. Anderson, of bovine mastitis, by Anderson, J. P. LaMaster, and G. H. Wise, and of methods of sanitation in the control of kidney and round worms of swine, by E. D. Kyzer, R. L. Jones, and Anderson.

[Work in animal pathology and parasitology by the Texas Station] (*Texas Sta. Rpt. 1937, pp. 12–17, 24, 40, 41, 136, 266–270, 271*).—The work of the year with livestock affections (E. S. R., 79, p. 103) briefly reported relates to loin disease in cattle, by H. Schmidt; anaplasmosis in cattle, by Schmidt and P. L. Piercy; infectious bovine abortion, by Schmidt, R. D. Turk, and O. C. Copeland; trichomonad abortion in cattle, by Schmidt, Turk, and C. N. Shepardson; loco weed poisoning (coop. U. S. D. A.), jimmies in sheep and goats, and miscellaneous poisonous plants (including red-stemmed pea vine (*Astragalus emoryanus*), *sacahuista* (*Nolina texana*), *Sartwellia flaveriae*, and two species of *Senecio* (*S. longilobus* and *S. riddellii*)), all by F. P. Mathews; loco poison, by J. Semb; disease resistance in animals, by B. L. Warwick, Schmidt, and Turk; at the Sonora Substation, swellhead of sheep and goats, hard yellow livers of sheep and cattle, contagious ecthyma (soremouth) of sheep and goats, stomach worms (*Haemonchus contortus*) of sheep and goats, infectious enterotoxemia of young lambs, and miscellaneous feeding trials of suspected plants, all by I. B. Boughton and W. T. Hardy.

[Work in animal pathology by the Wisconsin Station] (*Wisconsin Sta. Bul. 442 (1938), pp. 52–55, 57, 58, 64, 65, fig. 1*).—The work of the year in animal pathology (E. S. R., 78, p. 847) relates to the treatment of chicks with sulfur for coccidiosis, by C. E. Holmes, J. G. Halpin, and C. A. Herrick; the susceptibility of turkeys to chicken coccidia and chickens to turkey coccidia; the accuracy of the blood agglutination test for Bang's disease; the resistance of cows to Bang's disease, by M. R. Irwin and L. C. Ferguson (coop. U. S. D. A.); the part if any, that viruses play, in causing mastitis, by E. G. Hastings, E. H. Peterson, and F. B. Hadley; and further tests on tuberculins.

[Contributions on animal parasitology] (*Jour. Parasitol., 24 (1938), No. 6, Sup., pp. 8, 9, 10, 11, 12–19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32–36*).—Among the abstracts of contributions presented at the annual meeting of the American Society of Parasitology held in Richmond, Va., in December 1938 are the following: Comparative Efficiency of Various Technics for the Discovery of Protozoa and Helminths in Feces, by E. C. Faust, W. Sawitz, J. Tobie, V. Odom, C. Peres, and D. Lincicome (p. 8); Hematoxylin Staining of Protozoan Cysts Obtained From Feces by Zinc Sulphate Levitation, by H. S. Nickel (pp. 8, 9); *Bufo marinus* as a Vector of Helminth Ova in Puerto Rico, by W. A. Hoffman and J. L. Laner (p. 10); Preliminary Report on the Incidence of Trichinosis in Alabama, by J. H. Walker and C. G. Breckenridge (p. 10); Studies on the Protective Power of Serum From Dogs Actively Immunized Against *Ancylostoma caninum*, by G. F. Otto (pp. 10, 11); The Possible Role of Birds in the Epidemiology of Sylvatic Plague, by W. L. Jellison (p. 12); The Tick *Ornithodoros hermsi* as Probable Vector of Relapsing Fever in Northern Idaho, by C. B. Philip and G. E. Davis (p. 12); Blood Alterations in Typhlohepatitis of Turkeys, With Notes on the Disease, by E. P. Johnson and C. J. Lange (p. 12) (Va. Expt. Sta.); Cultures of *Pentatrichomonas* sp. in vitro From the Livers of Chickens and Turkeys, by E. A. Allen (p. 13), and Domestic Fowls as Carriers of the Poultry Gapeworm [*Syngamus trachea*], by E. E. Wehr (p. 13) (both U. S. D. A.); Goblet Cells and Age Resistance to Parasitism, by J. E. Ackert and S. A. Edgar (p. 13), and Effects of the Tapeworm *Raillietina cesticillus* (Molin) on Growing Chickens, by J. E. Ackert and A. A. Case (p. 14) (both Kans. State Col.); Susceptibility of Chickens to Reinfection With *Raillietina cesticillus* as Determined by the Presence of the Original Terminal Segment, by G. W. Luttermoser (pp. 14, 15) (U. S. D. A.); A Method for Testing the Role of Host Activity in Coccidian Periodicity, by D. C. Boughton (p. 15) (Univ. Ga.); Dried Milk Products in the Ration and Mortality With Cecal Coccidiosis in Chicks,

by E. R. Becker and P. H. Waters (p. 15) (Iowa State Col.); Observations on *Eimeria bukidnonensis* in New York State Cattle, by D. W. Baker (pp. 15, 16) (Cornell Univ.); Fifteen Cases of Experimental Bovine Venereal Trichomoniasis, by C. W. Rees (p. 16) (U. S. D. A.); Sterile Culture of the Free-Living and Parasitic Larval Stages of *Haemonchus contortus*, by R. W. Glaser and N. R. Stoll (p. 16); The efficacy of Phenothiazine for the Removal of Ascarids and Nodular Worms From Swine, by P. D. Harwood, A. C. Jerstad, and L. E. Swanson (pp. 16, 17) (U. S. D. A.); New Intermediate Hosts of the Fowl Tapeworm *Raillietina cesticillus* (Molin), by A. A. Case and J. E. Ackert (p. 17) (Kans. State Col.); Barium Antimonyl Tartrate as a Remedy for the Removal of Gapeworms from Chickens, by E. E. Wehr, P. D. Harwood, and J. M. Schaffer (p. 17), and Hemorrhage as the Cause of the Fatal Anemia Associated With Stomach Worm Infection in Sheep, by J. S. Andrews (pp. 17, 18) (both U. S. D. A.); A Study of the Periodicity and Synchronicity of the Pigeon Strain of *Plasmodium relictum*, by G. R. Coatney (p. 18); Cross Immunity Reactions in Avian Plasmodia, by F. Wolfson (pp. 18, 19); Studies on Immunity in Avian Malaria, With Special Reference to *Plasmodium circumflexum*, by R. D. Manwell and F. Goldstein (p. 19); Acquired Immunity to Ticks, by W. Trager (p. 20); The Localization of Glycogen in *Macracanthorhynchus hirudinaceus*, by T. von Brand (p. 21); Hemoglobin in Turtle Parasites, by G. W. Wharton (p. 21); A Study of *Haemoproteus sacharovi* in Pigeons and Mourning Doves With Notes on *H. maccalumi* of Mourning Doves, by G. R. Coatney and E. West (p. 21); Invasion of Young Red Blood Cells by Merozoites of Human and Avian *Plasmodium*, by R. Hegner (p. 21); Two Types of *Toxoplasma*-like Bodies in Canaries, by F. Wolfson (p. 22); A Staining Technique for Demonstrating Avian Malaria Parasites in Tissue Sections, by R. Hewitt (pp. 22, 23); *Lucilia* sp. Attacking Sheep at Beltsville, Maryland, by P. D. Harwood and A. C. Jerstad (pp. 23, 24) (U. S. D. A.); Parasite Studies on Ring-Necked Pheasants (*Phasianus colchicus torquatus*) (Gmelin) in Minnesota, by O. W. Olsen (pp. 24, 25), and A Hawk Tapeworm Which Produces a Proliferating Cysticercus in Mice, by L. R. Penner (p. 25) (both Univ. Minn. et al.); Variability in Hook Measurement in the Acanthocephala, by H. J. Van Cleave (p. 25) (Univ. Ill.); *Schistosomatium* From the Muskrat *Ondatra zibethica* in Minnesota and Michigan, by L. R. Penner (p. 26) (Univ. Minn. et al.); Studies on the Pre-cercarial Development of *Stichorchis subtriquetrus* (Trematoda: Paramphistomidae), by H. J. Bennett and A. G. Humes (p. 27) (La. State Univ.); On the Life Cycle of a Tapeworm, *Diphyllobothrium* sp., From the Herring Gull *Larus argentatus* Pont., by L. J. Thomas (pp. 28, 29) (Univ. Ill.); Life History of the Cecal Fluke *Postharmostomum gallinum* of Poultry, by J. E. Alicata (p. 29) (Univ. Hawaii); Observations on the Life History of *Spelotrema nicolli* n. sp. (Trematoda: Microphallidae), With the Description of a New Microphallid Cercaria, by R. M. Cable and A. V. Hunninen (pp. 29, 30) (Purdue Univ. et al.); The Life History of *Zygocotyl lunatum*, by C. H. Willey (p. 30); The Development of *Cercaria burti* Miller, 1923, in Leeches and Ducks, by C. H. Willey and Y. Rabinowitz (pp. 30, 31); Experimental Studies on *Posthodiplostomum minimum* (MacCallum, 1921), a Trematode From Herons, by M. S. Ferguson (p. 31); Age Resistance of Rats Against *Trypanosoma lewisi* and *Trypanosoma cruzi*, by J. T. Culbertson, M. H. Kolodny, and C. J. Duca (p. 32); Effects of Number and Age of Worms on Development of Primary and Secondary *Hymenolepis diminuta* Infections in Rats, by A. C. Chandler (pp. 32, 33); Specificity of Artificial Acquired Immunity to *Strongyloides ratti*, by A. J. Sheldon (p. 33) (Univ. N. C.); Constitutionally Dissimilar Lines of *Strongyloides ratti*, by G. L. Graham (p. 33); Studies on Dietary Deficiencies and Iron Salts in Ex-

perimental Canine Hookworm Infections, by G. F. Otto and J. W. Landsberg (pp. 33, 34); Three New Nematocides With a Consideration of Factors Governing Nematocidal Efficacy, by B. G. and M. B. Chitwood (p. 34), and Critical Tests With Iso-amyl-ortho-cresol for the Removal of Worms From the Dog, by A. C. Jerstad (pp. 34, 35) (both U. S. D. A.); The Effect of Dosage and Interval After Infection on Passive Immunity to the Nematode *Nippostrongylus muris*, by M. P. Sarles and W. H. Taliaferro (p. 35); Rapid Loss of *Trichinella* Larvae Fed to Immune Rats and Its Bearing on the Mechanism of Immunity, by O. R. McCoy (p. 35); A Note on the Cultivation of *Taenia taeniaeformis* Larvae in vitro, by J. H. Wilmoth (pp. 35, 36); and Development of the Microfilaria of *Dirofilaria scapiceps* (Leidy, 1886) in Mosquitoes of Minnesota, by P. R. Highby (p. 36) (Univ. Minn.).

Changes in the names of worms: The rules of zoological nomenclature as applied to veterinary helminthology, J. N. OLDHAM (*Vet. Rec., 50 (1938), No. 36, pp. 1131–1137, 1138*).—A five-page list of corrected names of helminths as now generally accepted and of some of the commoner synonyms is given.

Parasites of some Minnesota Cricetidae and Zapodidae, and a host catalogue of helminth parasites of native American mice, A. B. ERICKSON. (Univ. Minn.). (*Amer. Midland Nat., 20 (1938), No. 3, pp. 575–589, figs. 18*).—Descriptions of five new species and the erection of the genus *Spiruracerca* are followed by a host list.

Tapeworm studies.—VII, Variation in pasture infestation with M[oniezia] expansa, N. R. STOLL (*Jour. Parasitol., 24 (1938), No. 6, pp. 527–545, figs. 5*).—This report of further studies (E. S. R., 80, p. 685) includes a list of 24 references to the literature.

The rate of egg production of Strongylus equinus and Strongylus vulgaris as measured by egg counts and qualitative larval cultures, J. W. BRITTON (*Jour. Parasitol., 24 (1938), No. 6, pp. 517–520, fig. 1*).—A report is made of the egg-laying capacities of adult female *S. vulgaris*, *S. equinus*, and *S. edentatus* as determined by means of an egg count-larval culture method and post-morten examinations for worms.

Capsulation, "diffusion factor," and serological behaviour of group-B streptococci (Streptococcus agalactiae), D. F. STEWART (*Austral. Vet. Jour., 14 (1938), No. 5, pp. 180–183*).—In the course of studies of hemolytic and nonhemolytic strains it was found that certain of the group-B streptococci produce a diffusion factor. This power is not associated with the presence of capsules but appears to be a quality of the strain. No evidence was obtained that group-B streptococci form capsules.

Infection of the central nervous system by louping ill virus, F. M. BURNET and D. LUSH (*Austral. Jour. Expt. Biol. and Med. Sci., 16 (1938), No. 3, pp. 233–240*).—A report of an investigation by the quantitative egg membrane technic.

[Studies of the tolerance of animals for lead and arsenic]. (U. S. D. A.). (*Jour. Pharmacol. and Expt. Ther., 64 (1938), No. 4, pp. 364–464, figs. 6*).—The results of experimental studies conducted to establish the satisfactory tolerances for lead and arsenic in residues remaining on fruits and vegetables from the application of insecticides are reported as follows: The Chronic Effects on Dogs of Feeding Diets Containing Lead Acetate, Lead Arsenate, and Arsenic Trioxide in Varying Concentrations, by H. O. Calvery, E. P. Laug, and H. J. Morris (pp. 364–387); The Effect of Lead on Rats Fed Diets Containing Lead Arsenate and Lead Acetate, by E. P. Laug and H. P. Morris (pp. 388–410); The Storage of Arsenic in Rats Fed a Diet Containing Calcium Arsenate and Arsenic Tri-

oxide, by H. J. Morris and E. W. Wallace (pp. 411–419); The Growth and Reproduction of Rats Fed Diets Containing Lead Acetate and Arsenic Trioxide and the Lead and Arsenic Content of Newborn and Suckling Rats, by H. P. Morris, E. P. Laug, H. J. Morris, and R. L. Grant (pp. 420–445); The Influence of Calcium and Phosphorus on the Storage and Toxicity of Lead and Arsenic, by R. L. Grant, H. O. Calvery, E. P. Laug, and H. J. Morris (pp. 446–457); and Variations in the Arginase Concentrations in the Livers of White Rats Caused by the Administration of Arsenic and Lead, by H. D. Lightbody and H. O. Calvery (pp. 458–464).

Phenol-contaminated waters and their physiological action, V. G. Heller and L. Pursell. (Okla. Expt. Sta.). (*Jour. Pharmacol. and Expt. Ther., 63 (1938), No. 2, pp. 99–107, fig. 1; abs. in Okla. Sta. [Bien.] Rpt. 1937–38, pp. 4, 5*).—Report is made of extensive tests of waters contaminated by phenolic wastes from refineries, factories, and mines, conducted with rats during a period of 3 yr. It is concluded that "phenol even in appreciable concentrations is apparently not toxic to animals. A large amount of phenol is rapidly conjugated and eliminated in the urine as fast as absorbed and considerable seems to be metabolized or lost. The presence of concentrations less than 1 percent seems not to interfere with normal digestion, absorption, or other metabolic functions." Modified methods of analysis which eliminate some of the interfering materials are suggested.

Suckleya suckleyana, a poisonous plant, F. Thorp, Jr., and A. W. Deem. (Colo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 3, pp. 192–197, figs. 3*).—During the course of a limited survey of the plains section of northeastern Colorado, *S. suckleyana* was found growing in a number of water holes and irrigation reservoirs. Field evidence has indicated that this plant has been responsible for numerous cattle losses in that section of the State. It has been found by chemical analysis and feeding tests to be cyanogenetic, and the qualitative test for hydrocyanic acid was positive for every specimen examined. "Quantitative tests showed a variation of hydrocyanic acid concentration from 0.0364 to 0.002 percent, as compared with 0.0135 percent contained in a sample of stunted cane. The *S. suckleyana* which had the highest hydrocyanic acid concentration (0.0364 percent) proved, when force-fed, to be toxic for cattle, sheep, rabbits, and guinea pigs. Symptoms of intoxication developed rapidly, followed by death or a quick recovery, depending on the quantity administered. The sodium nitrate and sodium thiosulfate treatment brought about rapid recovery in one heifer which showed increasingly progressive symptoms of intoxication induced by artificial feeding."

Infectious laryngo-tracheitis, T. G. Hungerford (*Agr. Gaz. N. S. Wales, 49 (1938), Nos. 11, pp. 628–632, figs. 6; 12, pp. 679–683, fig. 1.*)—An account of this disease, which is widespread in New South Wales, the mortality varying in different outbreaks from 2 to over 80 percent.

Experiments on contagious abortion: Immunisation studies with vaccines of graded virulence, A. D. McEwen and F. W. Priestley (*Vet. Rec., 50 (1938), No. 35, pp. 1097–1105, 1106*).—By serial passage of a nonvirulent strain of *Brucella abortus* through guinea pigs, its virulence was progressively restored. Guinea pigs were vaccinated with this nonvirulent strain and with relatively nonvirulent variants of the strain obtained by guinea pig passage. The animals vaccinated with one or other of the passaged variants which had regained some slight degree of virulence were more resistant to infection than animals vaccinated with the original nonvirulent strain. . . .

"Vaccination with the passaged variant possessing the highest degree of virulence conferred the highest degree of protection. This variant was rough,

and vaccination with it did not stimulate demonstrable smooth agglutinins in guinea pigs. It is therefore concluded that an actively produced resistance to *B. abortus* infection has not any dependence on smooth agglutinins, and that there is not necessarily any relation between the antigen responsible for the stimulation of smooth agglutinins and those properties of the bacterial cells which stimulate resistance to infection. It is possible that these latter are possessed in greater quantity by strains of some degree of virulence than by nonvirulent strains. On the other hand, the longer persistence of strains of some degree of virulence in the tissues, rather than any specific quality associated with virulence, may be responsible for the superior immunizing properties of these strains over a nonvirulent strain.

"The experiments suggest that guinea pigs may have their resistance gradually enhanced by successive vaccinations with strains of gradually increasing degrees of virulence and the possibility of adopting a similar procedure in the immunization of cattle."

The concentration of sulfanilamide in the blood and milk of cattle and its effect on Brucella abortus and streptococcal infections of the bovine udder, W. T. Miller, C. K. Mingle, F. M. Murdock, and J. O. Heishman. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 3, pp. 161–171, figs. 6*).—Studies of the concentration of sulfanilamide in the blood and milk of lactating and dry cows and its effect upon bacterial organisms are reported upon, the details being given in tables and charts. It was found that a concentration of 15 mg. or more in 100 cc. could be produced in the blood and milk by giving an initial dose of 0.4 gm. per kilogram, and further, this level could be maintained by subsequent dosages of from 0.15 to 0.2 gm. per kilogram at 12-hr. intervals. Dry cows appear to concentrate the sulfanilamide in the blood more rapidly than lactating cows. Direct culture of the milk failed to show that this drug had any bactericidal action in *B. abortus* infection of the udders of the five lactating cows treated. Neither were any significant changes observed in the agglutination titers of the blood and milk. No change was observed in the condition of one of the two cows with udder infections caused by streptococci of Lancefield's group B that were treated with large doses of sulfanilamide, but the infection was apparently completely eliminated from the other cow. The administration of large doses of sulfanilamide resulted in a decrease in appetite and milk production in the treated animals, and a rise in temperature was observed immediately following termination of the treatment.

The wild rat as a host of Brucella abortus, C. P. Fitch and L. M. Bishop. (Minn. Expt. Sta.). (*Cornell Vet., 28 (1938), No. 4, pp. 304–306*).—In cultures made from 66 rats caught in a barn of the Minnesota Experiment Station which houses Bang-infected cattle only 1 was found infected by *B. abortus*. It is pointed out that a larger percentage might readily become infected under less sanitary conditions.

Evidence is accumulating to the effect that the common barnyard rat is a host to *Brucella* infection, that infection may pass from rat to rat by living in close contact and, furthermore, that *B. abortus* may be found in the urine and feces of rats. It might well be that abortion may occur in rats, although as yet it has not been demonstrated, and that aborted rat fetuses and fetal membranes may also be a source of contamination of foodstuffs of other animals. It is suggested that extermination of rats on farms infected with Bang's disease be one of the measures of sanitation recommended when an attempt is made to free the farm of this disease.

Pseudomonas aeruginosa in bovine mastitis, J. F. Cone (*Jour. Agr. Res. [U. S.], 58 (1939), No. 2, pp. 141–147*).—Report is made of the finding of *P.*

aeruginosa (*Bacillus pyocyaneus*) to be the cause of an outbreak of bovine mastitis of extreme severity involving 23 cows in the dairy herd of the U. S. D. A. Bureau of Dairy Industry at Beltsville, Md. The onset was sudden and accompanied by fever. With some cows milk production practically ceased during the acute stage of the disease. The affected quarters became blind in two cases and in others they remained hard and swollen, although secreting milk of normal appearance. Some of the cows continued shedding the organisms in small numbers long after the acute attack had subsided and the milk had become normal in appearance. The strains of *P. aeruginosa* isolated from mastitis cases and four strains obtained from other laboratories differed from Bergey's description of the species (E. S. R., 71, p. 28) in their inability to produce indole and their ability to ferment the simpler carbohydrates. The public-health and economic significance of *P. aeruginosa* in milk is discussed briefly. A list of 21 references to the literature cited is included.

The pathology of nonspecific mastitis and consideration of possible etiological agents, E. H. Peterson, E. G. Hastings, and F. B. Hadley. (Wis. Expt. Sta.). (*Cornell Vet., 28 (1938), No. 4, pp. 307–324, figs. 8*).—It is concluded that final proof that nonspecific mastitis is or is not a virus disease will have to be furnished by the success or failure of experimental transmission. There is a list of 26 reference to the literature.

Enzootic marasmus: The cobalt content of soils, pastures, and animal organs, E. J. Underwood and R. J. Harvey (*Austral. Vet. Jour., 14 (1938), No. 5, pp. 183–189*).—A continuation of the early work on enzootic marasmus in sheep (E. S. R., 74, p. 260). Cobalt determinations on a number of soils and pastures from healthy areas and from areas where sheep and cattle become affected were carried on. "The cobalt content of the livers of a number of 'affected' and healthy sheep was also investigated. The mean cobalt content of 22 samples of surface soils of those soil types which predominate on affected farms was found to be 0.6 p. p. m. Co on an air-dry basis (range 0.1–1.5). The corresponding figures for 27 samples of typical 'healthy' soil types adjacent to the above were 5.6 p. p. m. Co (range 0.2–32.0) and for 24 samples of soil types from outside healthy districts 10.4 p. p. m. Co (range 0.5–40.0). The mean cobalt content of 7 typical affected pastures was found to be 0.04 p. p. m. Co on dry matter (range 0.02–0.07). The corresponding figure for 11 healthy pastures was 0.16 p. p. m. Co (range 0.03–0.43). An experiment to test the effect of top dressing a typical affected pasture with small amounts of cobalt acetate was carried out. Very large increases in the cobalt content of the herbage were obtained; even 0.5 lb. per acre of this salt raised the cobalt content of the pasture above that of average healthy pasture. The mean cobalt content of the livers of 10 affected sheep was found to be 0.06 p. p. m. Co on dry matter (range 0.03–0.14). The corresponding figure for healthy sheep was found to be 0.28 p. p. m. Co (range 0.08–0.58). These results are considered to confirm fully the hypothesis previously advanced that enzootic marasmus is due to a deficiency of cobalt in the food. The significance of the variability in the analytical figures obtained is discussed in the text."

Observations on the toxicity of fluorine for sheep, A. W. Peirce (*Austral. Council Sci. and Indus. Res. Bul. 121 (1938), pp. 35, pls. 6, figs. 3*).—Report is made of feeding experiments in which rock phosphate of several sources and fluorine were added daily to the ration of chaffed hay and oats fed to young sheep for a period of 3 yr. The sheep which received 120 mg. or less of fluorine grew normally, ate the same amount of food, and remained in good health throughout the experiment. Those receiving larger doses of fluorine performed normally for about 1 yr., after which their food consumption and weight increase

declined and their health became greatly impaired. The food consumptions of the sheep receiving 160 mg. fluorine as Nauru rock phosphate and 170 mg. fluorine as Florida phosphate were 45 and 60 percent, respectively, of that of the controls during the second half of the experimental period, and the corresponding percentages for their weights at the end of the experiment were 55 and 70. Florida phosphate appeared to be less toxic than Nauru, the general health, food consumption, and weight increase of two of the group receiving the former being scarcely affected by the treatment. Ingestion of fluorine did not reduce the amount of wool grown significantly below that of the control animals. A list of 51 references to the literature is included.

A study of the helminth parasites of lambs in Ontario, A. M. Fallis (Roy. Canad. Inst., Trans., *22 (1938), pt. 1, pp. 81–128, figs. 30*).—This report of a study of the helminth parasites of lambs deals with their distribution within the host, the degree of infestation with various kinds and their seasonal variation, and the geographical distribution of the different species in the area from which the lambs came, the details being given in 12 tables.

In the course of the work 144 lambs received from 24 counties in Ontario lying between the southern boundary, Picton on the east and Wiarton on the north, were examined between April 1935 and July 1936. Eighteen of the 19 species of worms (belonging to 15 genera) found in the lambs were nematodes, the nineteenth being a cestode.

A note on the effect of repeated treatment of sheep for Haemonchus contortus, L. E. Boley, N. D. Levine, and W. G. Kammlade (Univ. Ill.). (*Cornell Vet., 28 (1938), No. 4, pp. 296–298*).—The results obtained in an attempt to appraise the value of repeated anthelmintic treatment, though made on a small number of animals, confirm and support those reported by other investigators. It is apparent that 4 successive treatments with 1 percent copper sulfate in 4 separate 4-oz. doses on alternate days, followed by 14 consecutive weekly treatments of 1 percent copper sulfate in 4-oz. doses failed to effect complete elimination of the stomach worm (*H. contortus*) from sheep. However, 2 successive weekly treatments with 5 cc. tetrachloroethylene following repeated preliminary treatment with copper sulfate proved slightly more effective, as judged by fecal and post-mortem examinations. Carbon disulfide and nicotine sulfate in repeated doses, like copper sulfate, suppressed but did not completely expel all *H. contortus* from naturally infested sheep.

Tuberculosis of sheep in Uganda, J. Carmichael (*Vet. Rec., 50 (1938), No. 36, pp. 1138–1147, fig. 1*).—The literature on tuberculosis in sheep is reviewed, and the details are given of 12 cases in sheep in Uganda, 11 of which were caused by the bovine and 1 by the human type of tubercle bacillus. Twenty-eight references to the literature are listed.

Tuberculosis of goats in Uganda, J. Carmichael (*Vet. Rec., 50 (1938), No. 36, pp. 1147–1154, fig. 1*).—The literature on tuberculosis of goats is reviewed, and the details are given of 10 cases of this disease in goats in Uganda, all of which were caused by the bovine type of tubercle bacillus. Twenty references to the literature are listed.

Pyogenic infection of goats and sheep in Tanganyika Territory, R. L. Cornell (*Vet. Rec., 50 (1938), No. 49, pp. 1653–1657, figs. 2*).—A report is made of the isolation of organisms of the genus *Corynebacterium* in pure culture from abscesses and caseous lymphadenitis lesions in goats and sheep, collected in the Mpwapwa district of Tanganyika Territory. The morphology, cultural characteristics, fermentation reactions, and pathogenicity for small animals are briefly described. Some infection experiments with goats are recorded.

Narcosis and anesthesia in swine produced by pentobarbital sodium, H. C. H. KERNKAMP. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 3, pp. 207, 208*).

A note on the prevalence and pathogenic importance of Hyostrongylus rubidus in pigs in North Queensland, A. L. CLAY (*Austral. Vet. Jour., 14 (1938), No. 5, pp. 194–197*).—A report on the findings in an outbreak of the swine stomach worm *H. rubidus* at Atherton, North Queensland. Parasites were present in 52.4 percent of 168 pigs examined at a bacon factory.

Trichomonad flagellates in facial lesions of a pig, R. HEGNER and J. E. ALICATA. (Univ. Hawaii et al.). (*Jour. Parasitol., 24 (1938), No. 6, p. 554*).

Equine encephalomyelitis diagnosed in Kentucky, L. J. GOSS. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 3, pp. 232, 233*).—Report is made of a case of equine encephalomyelitis, a study of which has established the presence in Kentucky of the western strain of the causative virus.

Sleeping sickness (encephalomyelitis), F. M. BOLIN (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 3, p. 16*).—In referring briefly to this disease and preventive measures, it is pointed out that the horse owner should not depend entirely upon vaccination for its control. Attention should be given to maintaining a good physical condition and protecting horses from mosquitoes, flies, and other biting insects during the sickness season.

Infectious anemia (swamp fever), W. S. GOCHENOUR, C. D. STEIN, and O. L. OSTEEN (*U. S. Dept. Agr., Farmers' Bul. 1819 (1938), pp. II+10, figs. 4*).—A practical account of this disease of the horse and mule.

Susceptibility of cats to tubercle bacilli, T. KUWABARA (*Kitasato Arch. Expt. Med. [Tokyo], 15 (1938), No. 4, pp. 318–329, pl. 1*).—It is concluded from the results reported that Japanese cats are not susceptible to the human type of the tubercle bacillus but that they are susceptible to the bovine type.

A comparative study of the manifestations and histopathology of canine distemper and experimental fox encephalitis infection in dogs, H. R. KRIESEL (*Cornell Vet., 28 (1938), No. 4, pp. 324–330*).—In the studies reported nuclear inclusions were found in the tissues of 9 puppies experimentally infected with the virus of fox encephalitis. "In a series of 54 puppies experimentally infected with the virus of canine distemper similar nuclear inclusions were noted in 10 percent of the cases, while cytoplasmic inclusions were found in 63 percent. The nuclear inclusions were observed in hepatic and Kupffer cells, reticuloendothelium of mesenteric lymph glands and spleen, and in glomerular endothelium of the kidney. Cytoplasmic inclusions were detected in epithelium of the bronchi and bile ducts and in reticuloendothelium of liver, mesenteric lymph glands, and spleen. The nuclear inclusions observed in both diseases were found to be composed of minute pink-staining granules, the aggregate of which produced a darker homogeneous-appearing body. Progressive stages of the inclusion-body formation were described. Cytoplasmic inclusions were observed in all of 7 ferrets experimentally infected with the virus of canine distemper."

An intracellular parasite encountered in ferret, N. D. LEVINE, G. L. DUNLAP, and R. GRAHAM (*Cornell Vet., 28 (1938), No. 3, pp. 249–251, fig. 1*).—Record is made of the presence of an organism, probably of the genus *Cryptococcus* or *Encephalitozoon*, in the liver and spleen of a ferret that had succumbed.

Identification of suspected beaver blood stains, R. FENSTERMACHER and B. S. POMEROY. (Minn. Expt. Sta.). (*Cornell Vet., 28 (1938), No. 3, pp. 257–260*).

Diseases and parasites of fur-bearing animals and their treatment, E. HEIDEGGER (*Pelztierkrankheiten und ihre Bekämpfung. München (Munich): F. C. Mayer, 1938, pp. 172, figs. 125*).—An account of the diseases and parasites of the silver fox (pp. 16–90), mink (pp. 91–126), and beaver (pp. 127–168), and their treatment.

Adult poultry mortality of noninfectious origin, R. E. LUBBEHUSEN and J. R. BEACH. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 3, pp. 209–222*).—A report is made of post-mortem examinations of 3,001 chickens from 7 to 36 mo. of age in a study of the pathological conditions of noninfectious origin associated with mortality in the development of culls, the details being given in 8 tables. "Lymphomatous infiltrations were predominant in 7- to 12-month-old chickens, constituting 45.3 percent of lesions in those that died and 65.3 percent in the culls. Each succeeding series has shown an increase in visceral lymphomatosis and a corresponding decrease in neurolymphomatosis. The greatest mortality occurred during the age period of 13 to 18 mo., that is, during the second half of the first year of lay."

Barium antimonyl tartrate as a remedy for the removal of gapeworms from chickens, E. E. WEHR, P. D. HARWOOD, and J. M. SCHAFFER. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 1, pp. 63–65*).—In the experiments here reported barium antimonyl tartrate was the best of the several substances tested for the removal of gapeworms of chickens and was very effective for this purpose. It was dusted over the birds and inhaled by them.

A study of the cellular elements and hemoglobin in the blood of chickens experimentally infected with Capillaria columbae (Rud.), C. OLSON and P. P. LEVINE. (Cornell Univ.). (*Poultry Sci., 18 (1939), No. 1, pp. 3–7*).—Observations of the blood cells and hemoglobin of two groups of chickens, one of which was experimentally parasitized with *C. columbae*, are reported upon, the details being given in table form. A leucocytosis of the heterophils and eosinophils and a slight anemia was detected in the infected chickens during the period when clinical symptoms of the infection were manifest. A list is given of 10 references to the subject.

The effect of infection with Davainea proglottina on the weights of growing chickens, P. P. LEVINE (*Jour. Parasitol., 24 (1938), No. 6, pp. 550, 551*).—The results of experiments to determine the effect of an infection experimentally produced with the poultry tapeworm *D. proglottina* on the weights of growing chickens are reported, the details being given in table form.

Eimeria hagani n. sp. (Protozoa: Eimeriidae), a new coccidium of the chicken, P. P. LEVINE (*Cornell Vet., 28 (1938), No. 4, pp. 263–266*).—A coccidium found in a culture from scrapings of the wall of the duodenum and intestines of a chicken while conducting a survey of the species of coccidia affecting poultry in New York State is described as new under the name *E. hagani*. The average size of the sporulated oocysts is $19.1\mu\times17.6\mu$. The time of appearance of the first oocysts in the feces is a little less than 7 days after the infective feeding. Sporulation of the oocyst takes place in from 24 to 48 hr. at 30° C. Round hemorrhagic spots, pinhead in size, are found in the wall of the duodenum and intestine of most infected chickens. Severe infections result in a catarrhal enteritis with the accompanying formation of mucous casts. *E. hagani* was demonstrated by immunity tests to be different from the other species of coccidia that undergo their entire development in the small intestine of the chicken.

[Studies of Eimeria tenella], C. C. ELLIS (*Cornell Vet., 28 (1938), No. 4, pp. 267–274*).—Part 1 of this contribution (pp. 267–272) reports upon the viability of the oocysts of *E. tenella*, with particular reference to conditions of incu-

bation, and part 2 (pp. 272–274) studies on the effect of temperature on the sporulation time of *E. tenella*.

An acute infectious disease of pullets apparently caused by Escherichia coli communis, N. M. Twisselmann. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 3, pp. 235, 236*).—Report is made of a rapidly fatal disease that appeared in a group of 250 pullets at the University of California and from which *E. coli communis* was isolated. It is pointed out that this organism may not have been the sole causative agent in the outbreak.

The migration of the etiologic agent of fowl leukosis when subjected to electrophoresis, C. D. Lee and H. L. Wilcke. (Iowa State Col.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 3, pp. 178–186*).—Work with fowl leucosis, the term used to indicate in common the group of transmissible, leukemic, aleukemic, and leukemiclike diseases of fowls, has shown that the disease in all its forms may be transmitted to healthy chicks by injections of cell-free filtrates. "The injection of a cell-free filtrate from one type apparently produces all of the various types considered as expressions of this disease, as neurolymphomatosis gallinarum, associated with eye lesions; hemocytoblastosis, lymphoid, erythroid, and myeloid leucosis were transmitted by a common etiologic agent. The behavior of the etiologic agent of fowl leucosis, when subjected to electrophoresis, is so like that of a virus that there seems little doubt that fowl leucosis is due to a filtrable virus. The etiologic agent of fowl leucosis migrates toward the negative pole at pH values of 4.01 to 6.01 and toward the positive pole at pH values of 7.01 and 9.01. The etiologic agent of fowl leucosis carries a positive charge between pH levels 4.01 to 6.01 and a negative charge from pH values 7.01 to 9.01. Protein tests show the etiologic agent was separated from its associated proteins by the electrophoretic method. The isoelectric point of the etiologic agent was found to be between pH values 6.01 and 7.01."

The inheritance of resistance to fowl paralysis (neurolymphomatosis), C. D. Gordon (*Alabama Sta. Rpt. 1937, p. 24*).—Data collected during the past 2 yr. are briefly noted.

Whole blood pullorum test studies, A. R. Winter. (Ohio State Univ.). (*Poultry Sci., 18 (1939), No. 1, pp. 26–30*).—Comparative data on the whole blood and tube pullorum tests are presented, together with information on the influence of time, temperature, agitation, serum, color of antigen, and ration on the results obtained with the whole blood pullorum test. There was found to be 99 percent agreement between the whole blood and tube test (1:50 dilution) on 5,867 birds where there was little pullorum infection. It is pointed out that this is not statistically significant because of the small number of positive birds involved. There was 87 percent agreement between the two tests in a group of birds which included many positive and doubtful birds. The higher the percentage of infection in a flock, the greater the percentage of disagreement that may be expected between the tube and whole blood tests. "The tube test detected a few birds with low agglutination titer not detected by the whole blood test. These birds are being subjected to further study. There was close agreement between the whole blood tests conducted at 40° F. and at 90°. The higher temperature reduced the time required for agglutination to take place. Rotation of the test plate after mixing the blood and antigen gave more reliable readings than when the plate was not rotated. More reliable results were obtained with a loop of whole blood than with a loop of serum in testing for pullorum with a stained antigen. Red antigen compared favorably with violet antigen when used in the whole blood test. Agglutination took place slightly quicker with the red antigen. The red antigen agglutination could be read more easily than the violet antigen agglutination in dim light. Feeding a heavy feed of wet mash containing

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20 percent soybean oil meal 2 hr. before making the whole blood test did not interfere with the test."

The value of chemically-killed cultures for the control of cholera in ducks, K. F. HILBERT and H. TAX (*Cornell Vet., 28 (1938), No. 4, pp. 275-280*).—Results of vaccinations of ducklings and breeder ducks against cholera are reported in detail in tables. On 4 ranches on which duck cholera was causing losses, 45,411 ducks and ducklings were vaccinated with a whole culture, phenol-killed bacterin and 5,761 birds, raised and fed with the others, were kept untreated as controls. The mortality from duck cholera averaged 4.1 percent in the vaccinated birds and 29.4 percent in the unvaccinated. It is concluded that the procedure is a means of controlling this disease even when the birds are kept under the insanitary conditions of the ordinary duck ranch.

The occurrence of papillomatous growths on the feet and legs of presumably iron-deficient turkeys, M. W. EMMEL. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 3, pp. 234, 235, fig. 1*).

Infectious catarrhal enteritis of young turkeys, W. R. HINSHAW and E. MCNEIL. (Calif. Expt. Sta.). (*Nulaid News, 16 (1939), No. 11, pp. 25, 26*).—In reporting on the catarrhal enteritis of young turkeys due to a diplozoic flagellate of the genus *Hexamita*, previously noted (E. S. R., 80, p. 688), the following measures are recommended as a means of prevention: (1) Selling all breeding birds at least 2 weeks before any poults are hatched; (2) complete isolation of the breeding unit from the brooding quarters; (3) separate attendants for the breeding flock and young poults; (4) use of cement yards, and wire pens; and (5) arrangement of feeding and watering equipment so that the attendant does not need to enter the pens.

The relationship of Hexamita sp. to an enteritis of turkey poults, W. R. HINSHAW, E. MCNEIL, and C. A. KOFOID. (Univ. Calif.). (*Cornell Vet., 28 (1938), No. 4, pp. 281-293*).—An investigation made of the relationship of a flagellate of the genus *Hexamita* to a catarrhal enteritis of turkey poults in California in connection with the studies noted above is reported. The disease has probably existed for many years, but due to increasingly congested conditions on turkey ranches it has become an increasingly important disease factor. It is State-wide in distribution, having been definitely diagnosed from Red Bluff in northern California to San Diego in southern California. This enteritis is principally confined to the duodenum and upper jejunum and is characterized by marked lack of tone, watery contents, distended bulbous areas, and a heavy infection of *Hexamita*. No other protozoa are present at the principal site of the pathology. The disease has been experimentally produced only when *Hexamita* has been present in the inoculum. *Trichomonas*, *Chilomastix*, and amebae have been definitely eliminated as the causative agent. Examinations of blood smears have not revealed any parasites, nor has any bacterium thus far studied been incriminated as the etiological agent.

An outbreak of pullorum disease in young guinea fowl, H. BUNYEA. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 3, pp. 233, 234*).—Report is made of an outbreak of pullorum disease in Maryland which resulted in the loss of some 300 1-week-old guinea fowl in a flock to which it had spread from a brood of White Leghorn chicks. This is thought to be the first recorded occurrence of pullorum disease in the guinea fowl.

Trichomonas gallinae (Rivolta 1878) the correct name for the flagellate in the mouth, crop, and liver of the pigeon, R. M. STABLER (*Jour. Parasitol., 24 (1938), No. 6, pp. 553, 554*).

American vultures and the toxin of Clostridium botulinum, E. R. KALMBACH. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 3,*

pp. 187–191).—A brief report is made of work conducted in continuation of that previously noted (E. S. R., 71, p. 705).

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Alabama Station, 1937], R. E. Yoder, F. A. Kummer, and E. G. Diseker (*Alabama Sta. Rpt. 1937, pp. 7–9*).—Progress results are briefly reported of investigations on the physical effects of tillage as related to plant growth, development of reduced friction surfaces and materials for experimental plows, and the dynamics of soil erosion and the principles of control.

[Agricultural engineering investigations by the Iowa Station]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1938, pts. 1, pp. 45–51, 52, 120, 121; 2, pp. 19, 20, 21, 22, 23, figs. 4*).—In part 1, farm building losses due to wind and fire, atmospheric exposure tests of wire and fencing, utilization of plywood in farm building construction, utilization of steel in farm building construction, and utilization of lumber in farm building construction are reported on by H. Giese; basin method of treating pastures to prevent erosion, run-off, and loss of fertility, and design, development, and trial of a two-way terracing machine, both by E. V. Collins; moisture accumulation in farm building insulation, by H. J. Barre; and life, service, and cost of service of pneumatic tires for agricultural equipment as indicated by the experience of users, and efficiency and economy of pneumatic tires for transport wheels on agricultural equipment, both by E. G. McKibben. In hillculture studies, by J. M. Aikman and M. Donnelly, an improved pasture contour machine and a motor-driven rotary cultivator of foreign manufacture, the rotating tines of which loosen the soil to a depth of 8 in., were tested.

In part 2, trials of the basin method of planting corn on representative soil areas of the State are reported upon by J. B. Davidson, Collins, A. A. Bryan, and H. R. Meldrum; efficiency of corn pickers, and weed control in growing corn, both by C. K. Shedd, Davidson, and Collins; hill spacing of check planted corn, by Collins, Davidson, Shedd, H. D. Hughes, and Bryan; and storage and curing of corn, by H. J. Barre, Davidson, Robinson, W. R. Swanson, W. B. Combs, and P. E. Hoppe.

[Agricultural engineering investigations by the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. 149–151*).—Tests of four types of subsurface drainage for terraces have been made by L. E. Hazen, who also reports on four trials of electrically charged barbed wire for restraining various kinds of livestock, smooth wire having given results in the first test such that it was omitted from the remaining three trials.

[Agricultural engineering investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 367* (*1938*), *pp. 13–15, figs. 2*).—Progress results are briefly presented of investigations on milk coolers, by J. E. Nicholas; improvements in potato cultivators and stone pickers, harvesting potatoes, and mechanics of tillage tools, all by A. W. Clyde; and electric fencing for livestock, by Nicholas and F. L. Bentley.

[Agricultural engineering investigations by the South Carolina Station]. (Partly coop. U. S. D. A.). (*South Carolina Sta. Rpt. 1938, pp. 89–94, figs. 3*).—Relative cost of labor and power in planting and cultivating corn when the size of the power unit varies is discussed by C. S. Patrick, and comparison of one-row horse-drawn combination cotton planters and fertilizer distributors by Patrick, G. B. Nutt, R. H. Jones, and E. E. Hall.

[Agricultural engineering investigations by the Texas Station] (*Texas Sta. Rpt. 1937, pp. 152–156*).—This work has included a study of mechanical harvesting of cotton, by H. P. Smith, D. T. Killough, and D. L. Jones; fertilizer placement and soil disturbance studies; treatment of cottonseed for planting purposes; planting of cottonseed at variable and uniform depths, including trials of the rubber press wheel and study of the width of furrow openers, and atmospheric exposure tests of wire and fencing, both by Smith; eradication of prickly pear, by W. H. Dameron and Smith; and garlic drying, by Smith and G. E. Alstatt.

[Agricultural engineering investigations by the Wisconsin Station] (*Wisconsin Sta. Bul. 442 (1938), pp. 26–31, 41–47, figs. 3*).—Progress results are briefly presented of investigations on erosion control, by H. O. and D. Anderson, D. M. Keyes, and P. E. McNall (coop. U. S. D. A.); development of new equipment for making alfalfa silage, by F. W. Duffee and H. D. Bruhn, including a loop divider for a mower cutter bar, a hay harvester, and a new molasses pump; ventilation equipment for chopped hay, by Duffee, Bruhn, L. F. Graber, G. Bohstedt, B. H. Roche, and E. B. Hart; drying grain in windrows before combining, by Duffee and Bruhn; rotary sprinkler irrigation, by Duffee, Bruhn, and H. L. Ahlgren; and sealing of wells, by Duffee.

Surface water supply of the United States, 1937, parts 6, 7, 9 (*U. S. Geol. Survey, Water-Supply Papers 826 (1938), pp. VII+376, pl. 1; 827, pp. IV+173, pl. 1; 829, pp. V+197, pl. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1937, No. 826 covering the Missouri River Basin, No. 827 the lower Mississippi River Basin, and No. 829 the Colorado River Basin.

Problems of water resources for rice irrigation, D. G. Carter and K. Engler (*Arkansas Sta. Bul. 371 (1939), pp. 31, pls. 2, figs. 13*).—The investigation here reported upon has been confined to the Grand Prairie region, located mainly in three counties of Arkansas and covering most of the rice-producing area of the State. Most of the water is pumped from Pleistocene water-bearing sands but some is taken from deeper wells reaching Tertiary sands. Available data having indicated a decline in ground water level in the wells, the work here discussed was undertaken to determine the duty of water for rice and the ground water conditions and to study the problems arising from using surface supplies.

It was found that there were 37 relifts, 1,226 operating wells, and about 1,000 idle and abandoned wells in the Grand Prairie in 1937. Power plants include about 570 Diesel engines, 580 electric motors, and 75 spark-ignition engines. The average acreage irrigated was 87.8 acres per operating well in 1937. The total withdrawal of water in the Grand Prairie from 1905 through 1937 is estimated at 5,268,000 acre-ft. No estimate of total resulting decline of the ground water level could be made, but an 8-yr. study of complete yearly records from 38 typical wells indicated a continuous decline with a total of 6.39 ft. from 1929 to 1937. This decline was verified by measurements on 59 additional wells measured both in 1929 and 1937. Summary records for three Grand Prairie streams indicate a relatively large total annual run-off. However, there are many periods of "no flow," which occur principally during the irrigation season. Evaporation is the largest loss from reservoirs, amounting to 30 in. or more per year. Data for 1936 and 1937 indicate an average evaporation loss of 0.12 in. per day, which is somewhat less than the average rainfall for the area.

Calculations and prevailing practice indicate the most economical size for reservoirs to be from 250 to 650 acres, practical depths of from 6 to 7 ft.;

and from 10 to 12 ct. per cubic yard for reservoir levee construction. Nomographic charts are included to afford a convenient method of solution for problems of duty of water and pumping.

The uses and possibilities of rubber in agriculture, A. Hay (*Brit. Rubber Pub. Assoc., Rubber and Agr. Ser. Bul. 8 (1938), pp. [1]+25, figs. 16*).—This is a compact summary of recent findings relating to the use of rubber in farm machinery, particularly as tires for drive and other transport wheels.

The evidence accumulated from various sources both in this country and abroad indicates that the use of the pneumatic tire for farm tractors and horse-drawn vehicles has led to greater efficiency in farm management. The deeper tread design of the farm tractor tire has proved more suitable for heavier soils and in areas of high rainfall. Larger-diameter tires are recommended for all but the smaller types of tractors. The use of the row-crop tractor with a narrow-section tire and a wheel of increased diameter has been very successful on mixed farms. Six- and eight-ply tires are recommended for agricultural tractors. Four-ply tires are only suitable for the lighter soils in areas of low rainfall. Wheel weights or water ballast are advisable as a means of overcoming slip. Antislip devices, including chains, strakes, or girdles, are necessary in areas of high rainfall and on heavy soils. Miscellaneous uses of rubber include horticultural equipment, grading machinery, grain drill tubes, sleeves for potato diggers, rubber blocks in the track construction of roadless tractors, and equipment for the eradication of bracken.

List of publications on the seasoning of wood. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1938, pp. [1]+20*).—This list includes publications that present the results of research of the Forest Products Laboratory on experimental and applied kiln drying, physical properties, air drying, and steam bending. It also contains a partial list of books on seasoning.

Mechanical properties of certain tropical woods, chiefly from South America, W. Kynoch and N. A. Norton (*Mich. Univ., School Forestry and Conserv. Bul. 7 (1938), pp. 87, figs. 3*).—The results of tests on the mechanical properties of nearly 40 tropical woods are presented and discussed. The data, while not conclusive, indicate the probable value of these woods for industrial uses.

Experiments on toxicity, leaching, and fire-retarding effectiveness of Wolman salts, R. H. Baechler. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1938, pp. [1]+10, figs. 4*).—The author reports investigations on two preservatives called, respectively, "Tanalith" (sodium fluoride, sodium chromate, sodium arsenate, and dinitrophenol) and "Triolith" (sodium fluoride, potassium bichromate, and dinitrophenol).

The toxicity determinations showed that both are very toxic to six typical wood-destroying fungi and have adequate toxicity for wood-preserving purposes.

In the severe leaching tests, the chromium salts proved highly resistant, the total leached throughout the test being only about 1 percent. About one-fifth of the arsenate leached from the Tanalith treated blocks. The sodium fluoride leached out more rapidly and completely than the other salts, the average proportion leached falling between 70 and 80 percent of the amount originally injected. It was found that the leaching of sodium fluoride from Triolith treated blocks started at a slower rate than from similar blocks treated with sodium fluoride alone, although the total leached at the end of the test was approximately the same. When the leached blocks were exposed to fungus attack in Kolle flasks, it was found that the leaching had been carried so far that they were not immune to attack but, against all but one fungus, they showed much greater resistance than the untreated control blocks. The fungus

Lenzites trabea, known to be arsenic tolerant, attacked the leached Tanalith treated blocks about as severely as it did the untreated blocks.

Lumber treated with from 0.79 to 0.88 lb. of Wolman salts per cubic foot of wood showed no significant resistance to fire in the Forest Products Laboratory fire-tube test.

Studies on the use of bitumens in soil stabilization and flexible pavement types, E. W. Klinger (*W. Va. Univ. Bul., 38 ser., No. 3–II (1937), pp. 128–133*).—Laboratory tests of two types of low-cost road construction are reported upon. In the first, or penetration method, the road would be shaped, after which bitumen would be applied and allowed to penetrate. The second method would be a modified mix-in-place construction whereby the soil of the roadway would be loosened to a suitable depth, pulverized, mixed with bitumen, and compacted by roller and traffic. Results indicated that the modified mixed-in-place method should be the more satisfactory. In the penetration method the use of admixtures of calcium chloride, sodium silicate, ammonia, or soap solution to increase the depth of penetration or the speed of penetration did not appear advisable. Water alone gave results that compared favorably with any of the solutions.

The stability of mixtures made up from each of the three soils used with varied proportions of water and of the several bitumens was determined by means of the Hubbard-Field stability testing apparatus. After these determinations of the proper amounts of moisture and bitumen and the correct proportioning of aggregates in mixes, the Kriege testing machine was used to test the final mixtures. These were compared with tests made on other premixed materials with known field results.

Transition curves for highways, J. Barnett (*U. S. Dept. Agr., Bur. Pub. Roads, 1938, pp. [1]+211, figs. 7*).—In this handbook the relation of speed to highway design is discussed, and a method for determining the required lengths of transitions under various conditions is presented, together with tables from which the required transitions can be chosen and located without extensive calculations. Other factors related to transitions, such as limiting curvature, superelevation, pavement widening, and right-of-way acquisition, are discussed.

Public Roads, [February 1939] (*U. S. Dept. Agr., Pub. Roads, 19 (1939), No. 12, pp. [2]+225–243+[1], figs. 33*).—This number of this publication contains data on the current status of various highway and grade-crossing projects receiving Federal funds as of January 31, 1939, and the following articles: Preliminary Results of Highway Capacity Studies, by O. K. Normann (pp. 225–232, 240); and Comparison of Methods for Determining the Hill Climbing Ability of Trucks, by C. C. Saal (pp. 233–239).

Field transport of cane on steel and rubber, L. A. Tromp (*Brit. Rubber Pub. Assoc., Rubber and Agr. Ser. Bul. 9 (1939), pp. [1]+32, figs. 16*).—The general trend of field transport of cane is subjected to detailed technical examination in this paper, with particular reference to the use of wheels equipped with steel and rubber tires. It is pointed out that a first condition for field transport is that the compactness of the soil must not be distorted, taking into consideration that the specific soil bearing is different under varying conditions of soil moisture—dry, medium dry, or wet. A second rule is to establish a practical limit to the soil bearing according to climatological conditions, i. e., the wheel or axle loads must be in relation to the wheel rim width, the wheel diameter, and the soil condition. On the basis that rim width is in direct proportion to the allowable wheel load, the conclusion is reached that the larger wheel diameter has a more solidifying action on the soil than the smaller one (less rut formation) for solid wheel tires, and the wheel load increases in

direct proportion to the rim width. It appears also that the caterpillar belt causes the lowest specific pressure on the soil of all rolling stock. The analysis indicates further that since the inflation pressure for pneumatic tires is related to the prevailing soil bearing, it follows that for hard paved roads the inflation pressure must be higher than for roads having less specific bearing capacity, i. e., for field roads.

Some things a farmer should know about electricity, H. L. Garver (*Washington Sta. Pop. Bul. 157 (1939), pp. 40, figs. 19*).—The terms and materials in common use in general wiring work are defined and described, and elementary applications of Ohm's law are explained. Knob and tube wiring and the use of loom, sheathed cable, armored cable, and rigid metallic conduit are dealt with, and the conditions under which each may be suitable are indicated. Information sufficient to permit the work to pass inspection in the State of Washington is given. The wiring of burglar alarms, excess and deficient temperature alarms, and other warning and control devices are also taken up.

Attention is directed to the dangerous possibilities of electrified fences. Until more definite safety standards have been established, "the Washington committee on the relation of electricity to agriculture cannot recommend electric fences."

Air-blast gin performance and maintenance, A. J. Johnson and T. L. Bagette (*U. S. Dept. Agr. Circ. 510 (1938), pp. 18, figs. 10*).—Results obtained with air-blast ginning by nozzle pressures of 9, 12, and 15 in. in an extensive series of tests (on cottons ranging widely in moisture content, staple length, and other conditions and qualities) show that the quality of the lint, by classifications and laboratory measurements, was slightly damaged when the nozzle pressure was reduced from 12 to 9 in., in ginning damp or wet cotton.

The 9-in. pressure was less efficient and caused losses in gin turn-out of 4 lb. per bale on the damper cotton, as compared with the 12-in. pressure. For the drier cottons, the bale-value losses for the 9-in. pressure operation were smaller because of lower losses in bale weight and absence of noticeable damage to quality. On increasing the nozzle pressure from 12 to 15 in., a decline in bale value was noted for both damp and dry cotton.

Increasing the nozzle pressure from 9 to 12 in. by increasing the fan speed increased energy consumption 12 percent. It may be possible in some gins, by improvements and adequate repairs, to slow down the fans and actually save power, and at the same time provide sufficient pressure for efficient air-blast doffing. Correct air-blast pressure in a commercial gin can best be maintained by an intake valve on the fan. Gin nozzles should be given periodic attention to be sure that they are open so as to allow the free passage of air at a tangent to the gin saws. Air-blast nozzle-pressure gage and air-blast nozzle-setting and width gages are useful in operating air-blast gins economically.

Mechanical milk cooling on farms, J. R. McCalmont (*U. S. Dept. Agr., Farmers' Bul. 1818 (1938), pp. [2]+21, figs. 11*).—The results already given on mechanical refrigeration (E. S. R., 73, p. 115) are presented and discussed, with suggestions for effective arrangement and operation. Plans for an inexpensive home-made storage tank and a refrigerator box are also included.

Plans of farm buildings for Western States. (Coop. 11 State cols. and univs.). (*U. S. Dept. Agr., Misc. Pub. 319 (1939), pp. 120, figs. 125*).—The plans here partly illustrated, compiled by the Bureau of Agricultural Engineering and the Extension Service, cover farmhouses and barns of various types; livestock shelters and related structural equipment; granaries and other storages; farm shops; machine sheds; garages; ice houses and other refrigerating struc-

tures; and processing and other special purpose buildings, including water storage structures, together with two forms of hay derrick.

Some engineering aspects of locker and home cold-storage plants, W. H. MARTIN (*Oreg. Engin. Expt. Sta. Circ. 4 (1938), pp. 18, figs. 5*).—This is a discussion of the refrigerating plant and its adaptation to locker storage. Information also is given on a small combined freezer and storage.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Alabama Station 1937] (*Alabama Sta. Rpt. 1937, pp. 6, 7*).—Included are brief findings by B. T. Inman of the work stock purchases outside the State, 1929–36, and the commercial feeds sold in Alabama in 1936 and manufactured from State-grown products, and a table by B. F. Alvord showing by years 1929–35 the average income from farm production and the value of farm-produced-family-used products for farmers of the United States and Alabama.

[Investigations in agricultural economics by the Iowa Station, 1937–38] (*Iowa Sta. Rpt. 1938, pts. 1, pp. 187–203, 207–219, 220–226, figs. 5; 2, pp. 71–73*).—In addition to results previously noted, some findings are reported in part 1 as follows: (1) Brief statement by J. A. Hopkins, C. C. Culbertson, and H. R. Meldrum as to costs of producing feeder calves as shown in a study of the records of from 53 to 65 southern Iowa beef-producing farms from 1932–34, inclusive; (2) table with discussion by Hopkins and L. G. Allbaugh summarizing for the State and five type-of-farming areas data as to income, management return, capital, gross income per $100 investment, gross value of crops per crop acre, livestock returns per $100 feed fed, etc., as shown by 951 farm records for 1937; (3) brief summary by R. Schickele of the percentages of persons favoring different legislative proposals on tenure problems as shown by a questionnaire submitted at public county hearings; (4) brief statement by S. H. Thompson as to the decrease in number of livestock marketing cooperatives in Iowa and reasons therefor, and relative amounts of business of members and nonmembers in one association; (5) some findings by Hopkins, Allbaugh, R. K. Buck, and C. Y. Cannon as to crops grown, utilization of corn, farm incomes, livestock enterprises, butterfat production, labor returns on dairies, etc., based on records for 1935 and 1936 for 61 farms in northeastern Iowa; (6) some relationships between income and budgeted family living expenses of 1,136 Resettlement Administration families studied by M. G. Reid; (7) table and text by F. Robotka showing the number of farm marketing, purchasing, service, and credit and insurance corporations in the State, capital, membership, volume of business, etc.; (8) a discussion by C. M. Elkinton of the probable effects of wage-hour legislation on rural farm commodity marketing agencies, with tables and charts showing the percentages of employees working 60 hr. or more per week and receiving less than 40 ct. per hour; (9) table showing the U. S. tariff rates ad valorem in 1932 (0–25 percent, 26–50 percent, 51–75 percent, and 76–100 percent) on items entering into farm production and living costs, and chart for 1929 showing the proportion and value of exports to the British market of important agricultural products from the Corn and Cotton Belts, and the grain and fruit areas of the United Sates, by T. W. Schultz; (10) some preliminary findings by Schultz as to the changes in and flexibility of farmers' production expenditures 1929–36; (11) some findings by G. S. Shepherd, M. D. Helser, and F. J. Beard as to differences in the value of different grade carcasses and the accuracy of the present live weight basis for buying hogs; (12) brief general findings by I. W. Arthur in a study of public regulation of livestock marketing;

(13) some findings by W. W. Wilcox and W. D. Goodsell as to the effects of the Tama County and North Central Regional Adjustment programs in 1937; (14) brief discussion by Allbaugh of the economic significance and possibility of substituting hay and pasture crops for intertilled and small grain crops in the Corn Belt; (15) findings by Hopkins, Allbaugh, J. B. Davidson, and A. B. Caine as to the average cost of keeping a horse, hours' work per horse, etc., on horse-operated farms in 1936–37, per hour cost of operation of one-, two-, and three-plow general-purpose tractors, relative costs of standard and pneumatic tire tractors, number of hours of man labor, and drawbar horsepower hours required to produce an acre of corn to harvest on general-purpose tractor and horse-operated farms; (16) some facts as to grading methods, weight, and quality classes used by poultry buyers, attitude of marketing agencies regarding uniform grades, etc., in a study by A. D. Oderkirk; (17) findings by P. Quintus and Robotka as to volume of business, percentage of cream grading as sweet cream, charges for hauling, total mileage of cream routes, etc., in a study of cooperative creameries in Butler County; and (18) tables by Schultz, A. C. Bunce, Allbaugh, Schickele, Wilcox, and C. A. Anderson showing the changes in crop areas on 73 farms in the southern pasture area of the State cooperating with the Soil Conservation Service, and a comparison of the land use in 1937 by cooperators and noncooperators. Also included are some findings in statistical investigations by G. W. Snedecor, G. M. Cox, and A. E. Brandt on the validity of applying analysis of variance to data arising from the radiation of virus exposed to X-rays for various periods of time, and of yield response of different varieties of oats to early and late planting.

Part 2 includes brief discussions by Robotka and R. C. Bentley of findings in studies of grain handling methods and grain merchandising practices of farmers' elevators and by Shepherd on corn loans as related to corn crop adjustments.

[Investigations in agricultural economics and farm management by the Cornell Station 1937–38] (*[New York] Cornell Sta. Rpt. 1938, pp. 72–79, 160*).—In addition to findings previously noted, brief general statements are made as to findings by L. Spencer in studies of milk distribution by 92 producer-retailers and of the surplus-milk problem in the New York milkshed, by W. Powell in a study of the factors affecting the costs of cooperative farm fire insurance, and by E. V. Hardenburg and P. J. Findlen on market quality of potatoes sold in city markets.

[Investigations in agricultural economics by the Oklahoma Station 1936–38] (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. 16–38, figs. 6*).—Tenancy as a factor in the agricultural conservation program of the State is discussed by P. Nelson, with a map showing the relation of farm tenancy to mineral resources of the State, and a table showing the land use, income, degree of erosion, and slope of land on farms operated by owners, part-owners, and tenants in Kiowa and Muskogee Counties. Using results of a 9-yr. study of wheat farming in Garfield County, the problem of wheat v. livestock is discussed with tables by Nelson showing data as to the average investment, size of farm, acreages and yields of wheat, percentages of total returns from livestock, and labor income on the farm studied by years 1929–37, and the organization and financial returns of the 10 most and the 10 least profitable farms by years 1930–37. Based on an analysis of the price movements of 24 Oklahoma farm commodities 1910–37 by T. R. Hedges, the factors responsible for the price movements of different types of commodities and the effects of sudden price changes are discussed. Some of the findings of A. L. Larson in studies of cooperative marketing made in cooperation with the U. S. Farm Credit Administra-

tion and the Oklahoma extension division are discussed. Tables show the dates of organization of cooperative elevators by periods, the average total sales by years 1926–36, and the gross income, expenses, and net gain in 1933 of such elevators grouped by the amounts of total sales. The method used by R. T. Klemme in preparing a land-ownership map for the State is described, and the uses of such a map illustrated. For a study of the effects of quality, volume, and distance from market on the value of cottonseed by K. C. Davis, charts are included showing by weeks 1937–38 (1) the Dallas prices for prime seed and the volumes sold by and prices paid to farmers, and (2) the cottonseed prices paid farmers and cottonseed meal and cottonseed oil prices. The effect of different factors in the price movements of cottonseed are briefly discussed. Using data gathered by Hedges in a study of the relationship of quality of cotton to prices received in local markets, the conditions in Oklahoma and the factors responsible for the lack of close relationship between price and quality are described and suggestions made as to means by which the relationship may be improved. Charts show the relationship between premiums and discounts for different staple lengths and different grades in local and central markets.

[Investigations in agricultural economics at the Pennsylvania Station 1937–38] (*Pennsylvania Sta. Bul. 367 (1938), pp. 11, 12*).—Included in addition to those previously noted are brief findings by J. E. McCord in a study of farm leases and tenancy and as to labor income, investment, receipts and expenses, crops, numbers of livestock, etc., in Centre County as shown by 1,262 farm records for the years 1931–37.

[Investigations in agricultural economics by the South Carolina Station 1937–38]. (Partly coop. U. S. D. A. et al.). (*South Carolina Sta. Rpt. 1938, pp. 15–26, figs. 3*).—Results of studies are reported as follows: (1) Findings by H. A. White and W. T. Ferrier as to changes in average staple length of cotton produced in the State 1928–36, (2) preliminary findings as to sources and types of loans, interest rates, etc., in the study of short-term credit, by Ferrier, (3) data as to farm mortgage recordings and interest rates, as to size and assessed value of taxable farm properties, as to trends of real estate taxes per acre, as to amount of real estate taxes delinquent 1928–37, and as to relation of sales prices and assessed values of farm real estate, by G. H. Aull and E. Riley, and (4) brief general findings by Aull in studies of taxation and the ability to pay as measured by net income, of the effects that might be expected from homestead tax exemptions, and the factors influencing the location of industrial plants in South Carolina.

[Investigations in farm and ranch economics at the Texas Station 1936–37] (*Texas Sta. Rpt. 1937, pp. 123–131*).—Included in addition to findings previously noted are (1) a brief statement by C. A. Bonnen, B. H. Thibodeaux (U. S. D. A.), and A. C. Magee showing average acreage in farm and acreage cropped, variation in returns to labor and management, and cotton yields per acre, etc., on 70 to 141 farms in the high plains cotton area studied from 1931 to 1936, and tables showing changes in numbers of tractors and work stock 1931 to 1937 and the significance of the changes from the standpoint of their possible effects on number and size of farms; (2) brief findings by W. E. Paulson in a study of quality as a factor in marketing vegetables in the lower Rio Grande Valley; (3) the correlations between test weight and protein content 1931–34 of wheat samples collected and studied by Paulson, G. S. Fraps, and R. T. Stewart of central and local market prices of wheat in relation to quality in the Panhandle area; (4) some findings as to methods of computing patronage dividends used by cooperative cotton gins and the effects of the

use of each method on dividends by L. P. Gabbard and Paulson as a part of a study of operating costs and financial conditions of gins in Texas in cooperation with the U. S. Farm Credit Administration; and (5) some findings by Gabbard and C. H. Hamilton relative to the income of tenants and owners, changes in the leasing systems, etc., in a study of the economic significance of different farm leasing systems in Texas.

[Investigations in agricultural economics by the Wisconsin Station 1937–38]. (Partly coop. U. S. D. A.). (*Wisconsin Sta. Bul. 442 (1938), pp. 3–26, figs. 8*).—Findings are included in the following studies: (1) Summary of the proportions of the consumers' dollar spent for fluid milk chargeable to payments to farmers, wages, salaries, depreciation, profit, and other items as found in the study by W. P. Mortenson, L. Witt, and C. Heisig of 13 Wisconsin dairy farms 1927–36; (2) data on proportion of total milk handled by large dairy plants as found in a study by A. W. Colebank, R. K. Froker, and A. C. Hoffman; (3) chart showing weekly sales of three kinds of cheese during the 2 weeks before, the week of, and the 2 weeks following a sales campaign as found in a study of records of 29 Louisville, Ky., stores for May–June 1938, by A. Hobson and M. A. Schaars; (4) the relation between factory price of cheese at the Plymouth market and average retail price in 51 cities 1919–32 found in a study by D. Anderson; (5) findings as to the reasons for the high level of tenancy in Wisconsin based on a study in Iowa County, by J. L. Spaulding, G. S. Wehrwein, and G. W. Hill; (6) brief statement of why tenants gained by renting large farms based on a study of 627 farm records for 1936, by B. H. Hibbard and P. E. McNall; (7) findings as to fixed charges per $1 of receipts, acre of cropland, and head of livestock on 20 farms having the highest and lowest incomes of 100 farms studied for 1935, by D. R. Mitchell and Anderson; (8) costs per acre, labor used, etc., for sugar beets on 52 farms studied in 1937, by McNall; (9) table based on study of H. H. Bakken and M. Beal showing the cost of producing beet sugar by three Wisconsin companies in 1933, 1934, and 1935; (10) findings by Anderson, and W. H. Ebling, W. H. Bormuth, and F. J. Graham of the Wisconsin Crop and Livestock Reporting Service as to organization of farm enterprises by owners and tenants, changes in percentage receipts of milk and milk equivalent of cream at Wisconsin dairy plants 1929 to 1936, seed production in Wisconsin in 1935, and changes in farm population in Wisconsin; (11) trends of butterfat production 1926–36 on 48 farms studied by Anderson and Mitchell; (12) some findings in the study by Hibbard and K. H. Parsons of the effect of the Wisconsin system of State aid for schools on property taxes paid by farmers, and (13) findings as to the location, method of operation, rental charges, benefits to farmers and city families, etc., of cold storage locker plants in a study by Schaars.

Landlord and tenant income in Colorado, R. T. Burdick (*Colorado Sta. Bul. 451 (1938), pp. 54, figs. 17*).—Analysis is made of tenant farm records obtained in the Greeley-Fort Collins area for the years 1922–35 to show the causes of variation in income and to determine the effects of prices, yields, and methods of leasing. The customary farm leases in other areas in Colorado are described. A proposed form for Colorado farm leases is included.

The tenant farms included in the study had an average of 141 acres in crops. The actual average yearly farm income 1922–35 was $1,603.62 for the tenants and $1,111.30 for the landlords. Tenants failed to have an income in 2 of the 14 yr. On a representative farm selected for detailed study the average farm incomes for the 14 yr. were tenant $2,479.28 and landlord $1,735.64. The tenant had no income in 5 of the years. Winter feeding of sheep and cattle added approximately $685.66 per year to the tenant's net cash income

and $267.37 to the landlord's income. Winter feeding benefited the tenant in 8 yr. and resulted in a loss in 6 yr. If the usual Corn Belt fifty-fifty lease had been substituted for the original lease on the representative farm, the average incomes from crops would have been tenant $900.53 and landlord $2,361.36 as compared with $1,793.62 and $1,468.27, respectively, under the original lease.

The tenants' variable expenses for potatoes and sugar beets were comparatively heavy, and consequently the landlords could survive lower crop yields or lower prices without a minus income. With barley and alfalfa the fixed costs of the landlords were relatively heavier, and the tenants could have survived lower yields. Farms of 160 acres were necessary if the tenant were to have a reasonable chance to have sufficient income to permit a down payment on a farm. Tenant farms in the area had better yields than owner farms, indicating that tenancy in the area operates under favorable conditions.

The trend in sale prices of farm real estate in Minnesota, A. A. Dowell (*Minnesota Sta. Bul. 338 (1938), pp. 24, figs. 4*).—The average sale prices by 2-yr. periods 1910–11 to 1936–37 are shown by counties for the southeast, southwest, east central, west central, northwest, and northeast districts of the State and the State as a whole. Other tables and charts show the index numbers of the prices (1912–13=100) for the districts and the State. The factors favorable and unfavorable to an increase in farm land values and the possibilities of stabilizing such values by different methods are discussed. The data for 1910–11 to 1928–29 are based on county records of actual transactions obtained by the Minnesota Tax Commission, those for 1930–31 being supplemented by sales made by various lending agencies. For 1932–33 through 1936–37 reports of sales by corporate agencies—insurance and trust companies, land banks, and the State of Minnesota Department of Rural Credit—made direct to the division of agricultural economics of the station were used.

The average sale value of farm real estate advanced from $41 per acre in 1910–11 to $82 in 1918–19 and to $104 in 1920–21, then decreased from $85 in 1922–23 to $60 in 1930–31, to $45 in 1932–33, and was $40 and $39, respectively, in 1934–35 and 1936–37. The trends in each of the six districts were upward to 1920–21, with a pronounced decline following, but the rate of increase and rate and duration of the subsequent decline varied greatly from district to district. The decline was checked in the northeastern and northwestern districts in 1932–33 and in the southwestern district in 1934–35. In the other three districts the decline continued through 1936–37, but was much less pronounced in the southeastern district than in the two central districts.

Capacity to pay and farm financing, L. J. Norton, J. Ackerman, and C. R. Sayre (*Illinois Sta. Bul. 449 (1938), pp. 173–224, fig. 1*).—This study of capacity of farmers to pay indebtedness is based on summaries of 1935 accounts kept by 1,055 cooperating farmers, of which 348 were owner-operators, 278 part owners, and 429 tenants. The sources of credit, types of security given, and interest rates are discussed. Analysis is made by tenure groups of debts and cash income, debts and capital, acres operated and value per acre, the influence of debts on working capital, and agencies financing different groups. The adjusting of financing plans to capacity to pay, land ownership and capacity to pay, the desirability of debt repayment, capital and capacity to pay, and a program for farmers with limited capital are discussed.

The average apparent capacities in 1935 to pay debts for all debt ratio groups in the less than $1,000 net income group were owners —$607, part owners —$407, and tenants —$242. In the $1,000–$1,999 net income group they were $166, $299, and $461, respectively. In the $2,000 or more group they were $1,732, $1,992, and $1,713, respectively. In the high income group the debts

of owners averaged about 6 times the yearly capacity to pay, those of part owners 4 times, and those of tenants 0.4 times. In the middle income group the debts of owners were 38 times the capacity to pay, those of part owners 14 times, and those of tenants 1.4 times. In the low income group there was no capacity in any tenure group. "In mortgage lending, according to this analysis, three plans involving different lengths of time for retiring debts are needed in order to fit a loan to the capacity of the borrower to pay it: Amortization in 10 yr. or less—for farmers having high capacity to pay and light debts. Amortization in 20 to 25 yr.—for farmers having high capacity to pay and heavy debts. Amortization in 35 to 40 yr.—for farmers having low or medium capacity to pay and heavy debts."

Montana farm foreclosures: Number, characteristics, and causes of farm mortgage foreclosures over a seventy-year period, with some suggestions for reducing them in the future, R. R. RENNE (*Montana Sta. Bul. 368 (1939), pp. 58, figs. 28*).—Analysis is made of the number, characteristics, and causes of foreclosures during the period January 1, 1870, to January 1, 1938. The farm credit problem of the State is discussed. Number and trend of foreclosures are discussed, and comparisons made with neighboring States and the United States. Some suggestions are made for securing more satisfactory farm credit practices. The foreclosure procedure in the State is briefly described.

During the period 1870–1938 nearly 34,000 real estate mortgages involving 11 million acres and $75,000,000 were foreclosed. There were 20,244 foreclosures during the period 1921–25, 6,898 during the period 1926–30, and 3,359 during the period 1931–37. The total claims—loan, interest, taxes, court fees, etc.—exceeded $100,000,000. Less than 6 percent of the total claims remained unsatisfied after foreclosure sales. Deficiency judgments were taken in about four-fifths of the cases where deficiencies remained. The foreclosed loans averaged 1⅓ times and the total claims nearly 2 times the productivity value of the lands as compared with less than two-thirds of the productivity value for all mortgaged farms. Resident individuals and resident agencies made loans corresponding more closely with productivity values than did other loaning agencies. Short-term loans (5 to 10 yr.), loans bearing over 6 percent, and straight-term loans were the least successful. Total claims averaged over 2½ times the amount loaned in the case of loans of less than $250, and less than 1⅒ times for loans of $10,000 or over.

"Farm foreclosures can be reduced by (1) basing loans on the productivity value of the lands as determined by a scientific soil survey and average yields and prices, (2) adjusting annual loan repayments to current income and in terms of buying power rather than dollars, (3) effecting a strong credit education program to familiarize borrowers and lenders with the consequences of unwise credit practices and the permanent advantages to be secured from more scientific lending policies, and (4) incorporating improved farm management and land utilization practices in farm mortgage contracts."

An economic study of farming in the Crooked Creek area, Indiana and Armstrong Counties, Pennsylvania, D. H. WALTER. (Coop. U. S. D. A.). (*Pennsylvania Sta. Bul. 369 (1938), pp. [2]+42, figs. 9*).—The area studied is one in which a demonstration project for practical erosion control was begun by the U. S. D. A. Soil Conservation Service in 1934. Usable survey records for 344 full-time farms were obtained for the year beginning April 1, 1934, before the program was started, and for 148 farms for the year beginning April 1, 1936. The second survey included 55 cooperators and 93 noncooperators in the conservation program. The area is described. Using the data from the first survey, analysis is made of land uses, numbers of livestock, types of farming, farm income, tenancy, crop and livestock production practices, the factors affecting

labor income, etc. The problems of soil conservation, contemplated changes under the program, changes accomplished, and the possible effect of the program on production are discussed. Some of the findings were: From 25 to 75 percent of the original top soil had been lost from 49.8 percent of the total farm land, and over 75 percent on 19.2 percent of the land. The gross receipts per farm averaged $1,150, of which 47.4 percent came from dairying, 73.7 percent from all livestock, and 13.8 percent from crops. The average labor income was —$119. On 41 of the 344 farms it was from —$600 to —$1,000, on 186 from —$1 to —$599, on 92 farms from 0 to $599, and on 25 farms from $600 to over $1,000. The average for owner-operators was —$114, for part-owners —$127, and for tenants —$125. Number of animal units, crop yields, livestock production, and efficiency of man labor were four important factors affecting labor income. The average labor incomes with none to all of these factors above the average were: No factor —$332, one factor —$243, two factors —$111, three factors 0, and all four factors $304. The average size of farm was 122.2 acres, of which 58.8 acres were in crops, 17.5 in woods, 28.5 in pasture, and 17.4 acres in "other land," mostly idle or abandoned. The agreement of 55 farmers cooperating with the Soil Conservation Service called for an average increase of 6.2 in crops, 5.9 in new forest plantings, and 3.8 acres in permanent pastures, and a decrease of 13.4 acres in other land. Most of the change in land use from 1934 to 1936 was in rearrangement of field boundaries and contour farming rather than in acreage.

Farm organization by land class on the Eastern Highland Rim, C. E. Allred and A. C. Robison (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 89 (1939), pp. III+28, figs. 11*).—Tables are included and discussed showing by land classes the distribution of farms, major land uses, size of farms, investment, sources of receipts, current expenses, sources of farm labor, etc., and the relations to land class of man-equivalents and man-work units per farm, crops, livestock, diversity index, farm expenses, outside employment of operator, tenure of operators, etc. The data covered 131 farms and were secured in a farm management survey in Overton County, based on the 1936 crop year.

A study of farm organization by types of farms in Uinta Basin, Utah, G. T. Blanch (*Utah Sta. Bul. 285 (1939), pp. 91, figs. 10*).—The location, history, topography, climate, soils, irrigation water supply, transportation facilities, markets, timber and other resources, economic and social conditions, land ownership, utilization of public grazing lands, etc., are discussed. Analyses are made of 285 detailed farm records for 1935 obtained in the reservation area, and 103 obtained in the Ashley Valley area.

The average labor incomes on the different types of farms and ranches in the reservation area were: General —$155, dairy —$21, mixed livestock —$6, beef —$419, sheep $840, and part-time —$202. In the Ashley Valley they were $6, $24, $963, $554, $288, and —$139, respectively. In addition, the value of farm privileges ranged from less than $250 for the part-time farms to nearly $500 for the range livestock farms. The important factors affecting the financial success of the farms were type of farming, rates of production (including crop yields, percentage lamb crop, percentage calf crop, wool per sheep, and pounds butterfat per cow), death loss of livestock, size of farm business, and efficiency in the use of man-labor. The most successful farms were better than average in several of these factors. Average number of man-days of labor available but not needed on the farms ranged from 118 on beef ranches to 221 on general farms and 231 on part-time farms in the reser-

vation area, and from 7 to 79 on sheep, beef, and mixed livestock ranches to 133 to 181 on dairy, part-time, and general farms in the Ashley Valley.

Some trends in Utah's agriculture, W. U. FUHRIMAN (*Utah Sta. Bul. 286 (1939), pp. 30, figs. 9*).—Weighted index numbers were computed for crop and livestock yields and intensity, combined yields and intensity, size of farms, and production. The period 1926-31 was used as the base for the index numbers.

Acreages harvested increased until about 1920, remained fairly constant 1920-33, decreased in 1934 during the drought, then increased, but were about 4 percent less in 1937 than the 1926-31 average. The trend in the number of productive animal units per farm was generally upward until about 1931. There was a marked decrease in 1935, and since that time the number has been 5 to 10 percent below the 1926-31 average. Intensity of crop production increased about 15 percent from 1910-20, decreasing about 15 percent in the next decade, and in recent years has been only slightly above 1910. Intensity of livestock production increased from 91 in 1920 to 101 in 1929 and 105 in 1935 and 1936 (1937=103). The trend of crop yields was sharply upward until 1905, after which crop yields fluctuated rather widely, the fluctuations coinciding to a marked degree with fluctuations in precipitation. Yields from 1931 to 1937 were lower than in any period of like length in 50 yr. The trend in yields of livestock products per animal was generally upward until about 1926. Since that date it has been fairly constant except for the low year 1932. The trend of total production of crop and livestock products was upward until the late twenties. Since 1930 it has been about 14 percent below that of the previous 7 yr. The average cash income for crops and livestock 1931-37 was only 60 percent of that of the preceding 7 yr. The number of farms increased 18 percent 1925-35. The average production and cash income per farm for the period 1931-37 were 76 and 53 percent, respectively, of those for the preceding 7 yr.

Part-time farming in the United States: A selected list of references, compiled by H. E. HENNEFRUND (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 77 (1939), pp. VI+272*).—Included are 777 references to materials on part-time farming and subsistence homesteads in the United States published from approximately 1900 through October 1938. References to marginal or subsistence farming by full-time farmers, the Little Landers' Movement in California, farm laborers' allotments, garden cities and greenbelt communities, and war time gardens for increased production are omitted. The first 342 items are general references. The remainder are grouped by States.

Costs and returns in producing potatoes in central Maine, W. E. SCHRUMPF (*Maine Sta. Bul. 392 (1938), pp. [3]+34, figs. 4*).—An analysis is made of the costs of production and disposal of the potato crops harvested in 1929 and 1930 on central Maine farms and of the effects on the costs and returns of such factors as size of potato enterprise, yields, labor efficiency, etc. The data were obtained by personal visits to the producers of table potatoes on 38 farms. A method of estimating the cost of growing and harvesting potatoes where different prices prevail for labor, seed, fertilizer, etc., is presented.

Relatively large acreages tended to be associated with relatively low costs of production per acre and relatively high yields with high costs of production per acre and low cost per barrel. Selling costs per barrel varied with the amount of potatoes sold. The average cost of production on the farms studied was $110.28 per acre or $1.15 per barrel, of which about 40 percent was for fertilizers, 34 percent for labor, power, and equipment, and 13 percent for

seed. The average cost of harvesting was $16.85 per acre or 17.4 ct. per barrel, of which about 93 percent was for labor, power, and equipment. Costs of storage averaged about 26 ct. per barrel harvested and 38.8 ct. per barrel stored. Selling costs averaged 8.5 ct. per barrel harvested and 9.9 ct. per barrel sold. Farms above the average in acres of potatoes, yields of potatoes per acre, and acres of potatoes per man returned an average net income of 95 ct. per barrel as compared with 67 ct. per barrel for all the farms.

The tobacco industry: A selected list of references on the economic aspects of the industry, 1932–June 1938, compiled by L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 75 (1938), pp. VIII+337*).—Included are 1,205 references to books, pamphlets, and periodical articles on the economic aspects of the leaf and manufactured tobacco industry in the United States and foreign countries published from 1932 through the first half of 1938.

References are included on the agricultural adjustment and control programs for leaf tobacco of the U. S. Department of Agriculture, and on cost of production, credit, grading, standardization, inspection, labor, legislation, marketing, price, statistics, taxation, advertising, sales campaigns, and the financial standing of tobacco companies, as well as on labor problems, taxation, and other aspects of the manufactured products industry. The section on the United States (references 1–801) contains two parts, one on leaf tobacco classified by subjects with sections on Puerto Rico and the Philippine Islands, and one on tobacco products classified by subjects. The references to foreign countries are grouped by countries, and while not complete, an attempt was made to include the more outstanding references to foreign publications in the libraries of the U. S. Departments of Agriculture and Commerce and the Library of Congress. References are not included on diseases and pests, physiological aspects, chemical aspects (except a few on tobacco curing), and technical processes of manufacturing tobacco products.

The peach enterprise in western New York: Soil relationships, costs and returns, and marketing, H. F. DeGraff (*[New York] Cornell Sta. Bul. 710 (1939), pp. 37, figs. 6*).—Using data on yields and changes in number of bearing trees for 160 orchards in Newfane Township, Niagara County, 1926–36, obtained in a series of farm-management surveys, the relation of three groups of soils to yields and mortality of trees are discussed. Based on data obtained in 1936 for 120 orchards 4 yr. or older on 52 farms in Porter Township, Niagara County, analysis is made of the costs of growing peaches to harvesting by types of expenditures and operations, of costs for harvesting, packing, and marketing, and returns per acre, bushel, and hours of labor. Using data on marketing peaches obtained from growers in Newfane Township for 1936 and from Porter Township growers for 1936 and 1937, the grading, packing, and storing of peaches, the types of buyers, sales outlets, etc., are discussed.

The average yield per tree 1926–36 on the shallowest and poorest drained soil group was 0.68 bu. as compared with 1.13 bu. on the deepest and best drained soil group, and 0.86 bu. on the intermediate group. Only two-thirds of the trees remained on the poorest soil group at 7 yr. of age. On the best soil group two-thirds still remained at 20 yr. of age. For both yields and mortality the soil differences showed up most markedly after 5 or 6 yr. The average cost for the Porter Township orchards up to harvest in 1936 was $53.96 per acre and 44.8 ct. per bushel, of which labor comprised 32 percent, materials 20 percent, taxes, interest, and orchard depreciation 33 percent, power 9 percent, equipment 5 percent, and miscellaneous expenses 1 percent. The cost of harvesting, packing, and marketing averaged 22.5 ct. per bushel. Credit

for culls sold amounted to 25 ct. per acre or 0.2 ct. per bushel. The average net returns were $52.61 per acre, 44 ct. per busheel, and 89 ct. per hour of labor.

Marketing fruits and vegetables on farmers' markets, New York Metropolitan District, M. P. RASMUSSEN (*[New York] Cornell Sta. Bul. 709 (1938), pp. 60, figs. 28*).—This study was made as a part of that on the use of motortrucks in marketing fruits and vegetables (E. S. R., 79, p. 411). Data were gathered during the summer of 1934 from 267 growers who sold fruits and vegetables chiefly on the Harlem, Wallabout, and Gansevoort farmers' markets. The places of origin and disposal of produce, size of farms, gross sales, commodities sold, seasonal movement of produce, types of containers used, fees incident to use of the markets, the opinions of growers concerning operations of a market, and the marketing problems of the markets are discussed.

Approximately 89 percent of the produce sold by these growers was marketed on farmers' markets in New York City, and of this approximately 34 percent was sold to hucksters, 33 percent to jobbers, 32 percent to independent retailers, and 1 percent to chain stores. The average cost of operating 283 farm trucks was 8.7 ct. per mile, or 8.3 ct. per mile per ton of fruits and vegetables. "In the opinion of these growers, increased use of the motortruck has had little, if any, effect on grading practices. About 36 percent of the growers thought use of the motortruck had resulted in lowered prices, but one-fifth thought the opposite, and 43 percent had been unable to observe any effect." The gross sales price per ton on the three farmers' markets was about $2.90 higher than that in the wholesale markets on Washington Street, and net returns to growers were about $1.11 per ton higher. Average costs of marketing were $11.40 per ton on the Washington Street market and $7.36 on the farmers' markets, the major differences being $2.56 per ton for containers and 90 ct. lower selling costs. Costs of marketing per ton did not necessarily increase with distance, because larger loads were usually hauled in the case of longer distances. As size of average load increased, costs per ton for transportation and selling declined, but cost of containers remained about the same. The usual expense per trip incurred by growers exclusive of transportation and services of growers' family or hired labor in selling was $5.60 to $6.50. The average time per trip to market was 19 hr. and 32 min.

"The major problems on these markets seem to be: To improve the quality of salesmanship on the market; to work out some means of obtaining a reasonably accurate knowledge of available supplies daily before trading starts; to develop sound economic grade standards, which buyers are able and willing to pay for and which growers can meet at reasonable cost; to standardize offerings as to weight within reasonable limits; and to reduce costs of marketing. It may be possible for growers to attain a higher quality of salesmanship by the following procedures: By hiring special marketmen who are recognized as good salesmen; by groups of growers selecting one of their number who has the required qualifications to sell the output of the group; by establishing a cooperative (farmer-owned and controlled) sales agency on each farmers' market; by establishing an auction system of selling on each farmers' market; [and] by making more complete use of professional salesmen, such as commission merchants, brokers, and the like."

Methods and costs of marketing potatoes in Pennsylvania, W. R. WHITACRE (*Pennsylvania Sta. Bul. 372 (1939), pp. [2]+25, figs. 7*).—The location and nature of the potato industry in Pennsylvania, varieties grown, types of markets and marketing methods, and the direct and indirect competition with other States are described. Using data furnished by cooperative marketing groups

in Somerset, Indiana, and Butler Counties, detailed analyses were made on the costs of marketing and the relation of such costs to net returns for approximately 82,800 bu. of potatoes in the 1936-37 season. Some data are also included as to costs and net returns for potatoes marketed through cooperative groups in Lancaster and Potter Counties, and costs of selling potatoes at the farm, in local markets, and in city markets in Bucks, Lehigh, and Schuylkill Counties.

The data indicate that if the policy of cooperative groups of placing sales emphasis on U. S. No. 1, 2-in. minimum grade, is continued, there is relatively little opportunity to lower market costs per bushel. Bag, transportation, and grader costs are to a large degree constant. Labor costs were not directly correlated with quality. Cost of sacks was the chief item varying with quality. Grading facilities and predominating type of defects influenced labor costs more seriously than total percentage of defective potatoes. Costs of marketing in the cooperative groups studied ranged from 10.8 to 31.6 ct. per bushel during the 1936-37 season, generally being 21 or 22 ct. Net returns per bushel in general increased proportionately with increases in marketing costs.

Livestock shipping associations, A. A. Dowell and S. T. Warrington (*Minnesota Sta. Bul. 339 (1938), pp. 24, figs. 7*).—The developments in the cooperative shipping movement through 1936 are briefly reviewed. Data as to organization and operation of associations in Minnesota in 1936, obtained from officers in a field survey in the summer of 1937, are analyzed. Analysis is also made of the factors responsible for the changes in the number of associations, number of members, volume of business, etc. The more important problems confronting individual producers in marketing livestock and possible methods of assisting them are discussed.

The number of associations in Minnesota decreased from 655 in 1919 to 520 in 1931 and to 262 in 1936, the number of members decreased from 124,000 to 45,000, and the volume of business handled from 61 percent of livestock marketed by Minnesota farmers to 13 percent. Of the associations in 1936 nearly 29 percent had fewer than 100 members each and 78 percent less than 225 members. Approximately 20 percent shipped less than 1,200 head of livestock, and 80 percent less than 4,800. Approximately 63 percent of the livestock shipped was sold to cooperative commission companies, 14 percent to private commission companies, and nearly 23 percent direct to packers. The increase of mileage of hard-surfaced roads and the number and efficiency of motortrucks, improved grade standards, and availability of market news resulted in many producers dropping out of associations. "If local associations are to meet the requirements of farmers in many parts of the State, they must be organized as marketing rather than as forwarding associations. To insure adequate volume to justify the expense of a capable manager, office and yard force, adequate equipment, and keeping in touch with the available outlets, the association should have 500 to 1,000 or more members."

Organization and management of the Falls Cities Cooperative Milk Producers' Association, J. B. Roberts and H. B. Price (*Kentucky Sta. Bul. 390 (1939), pp. 37-87, figs. 13*).—This bulletin describes the organization of the Falls Cities Cooperative Milk Producers' Association, the chief representative of milk producers in the Louisville milk market, reviews the experiences of the association, and points out the problems encountered and the methods used by the association in solving specific problems. It is based on information and data secured from the records of the association, the Louisville milk market administrator, the city health department, and through interviews with the management of the association, 281 farmers (about 20 percent of all shippers of graded milk), and about two-thirds of the dealers in the market. The his-

tory and plan of organization of the association are described. The plans used in selling milk, prices of market milk, the price policy for different classes of milk, other phases of the price problem, the surplus problem and adjusting supply to demand, hauling of milk, the service activities of the association, the financing and the operating costs of the association, and the membership relations are discussed.

Report on the agricultural implement and machinery industry.—I, Concentration and competitive methods. II, Costs, prices, and profits (*U. S. House Represent., 75. Cong., 3. Sess., Doc. 702 (1938), pp. XXI+1176, [figs.] 17, maps 3*).—This is a report, including conclusions and recommendations, of the Federal Trade Commission on the agricultural implement and machinery industry. Part 1 (pp. 1–390) "deals with the economic factors upon which the production and distribution of farm implements and machines is based, the history of developments by which the bulk of production and wholesale distribution both in domestic and foreign trade has become concentrated in the hands of a few large manufacturing companies, the extent of concentration of production by such companies, the nature of distribution organizations and agencies by which implements and machines are sold, the factory equipment and programs of operations of typical manufacturing plants, and competitive methods and practices pursued by both manufacturers and dealers, with special attention to methods and practices which may involve restraint of trade or tend to produce further concentration of control or monopoly in production and distribution." Part 2 (pp. 393–1038) deals with "the investments and profits of farm implement and machinery manufacturers, their varying costs of production for a variety of products, the prices received by manufacturers and dealers, the prices at which machines are sold in foreign markets, a comparison of the movement of the prices of farm machinery with the movement of the prices of other comparable commodities, and the investments and profits of retailers of farm implements and machines."

Agricultural relief measures relating to the raising of farm prices—Seventy-fifth Congress, January 5, 1937 to June 16, 1938, compiled by M. E. Wheeler and M. I. Herb (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 76 (1939), pp. V+109*).—This is a companion list to those previously noted for the Seventieth, Seventy-first, and Seventy-second Congresses (E. S. R., 74, p. 871). The bills are classified under the major agricultural relief plans considered in the Seventy-fifth Congress. Extracts from the Congressional hearings on the bills are included.

Agricultural price control in foreign countries: Some outstanding examples (*U. S. Dept. Agr., Foreign Agr. Serv., Foreign Agr., 3 (1939), No. 2, pp. 43–83*).—"This article describes some of the more important developments in the field of agricultural price control in foreign countries and attempts to evaluate the results thus far achieved, from the standpoint of the consumer as well as of the producer." The countries considered are Germany, Italy, Japan, Argentina, Australia, Canada, Denmark, France, the Netherlands, New Zealand, and the United Kingdom.

Trend of farm prices in N. D., W. O. Brown (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 3, pp. 5–7, figs. 2*).—Charts show for the period 1910–38 (E. S. R., 62, p. 783) index numbers (1910–14=100) of prices received by farmers in North Dakota for farm products (combined index 14 commodities), and paid by farmers in the United States for commodities used in production and family maintenance and of the purchasing power of North Dakota farm products. The index numbers for individual products for 1938 were: Wheat 77, rye 60, oats 54, barley 61, flax 96, potatoes 66, sheep 74, butterfat 97, eggs 87, cattle 127, hogs 104, lambs 119, wool 110, and chickens 117 percent.

[Oregon cash farm income] (*Oregon Sta. Circ. 130 (1938), p. 47, fig. 1*).—A map shows the total cash income from certain specialty farm products by type-of-farming districts of the State.

Crops and Markets [January–February 1939] (*U. S. Dept. Agr., Crops and Markets, 16 (1939), Nos. 1, pp. 24, figs. 3; 2, pp. 25–48, figs. 3*).—Included are reports, tables, summaries, charts, etc., covering crops, livestock, farm prices, farm labor, farm wages, etc., and market reports on cotton, dairy and poultry products, feeds, seeds, grains, and livestock and livestock products. No. 1 includes an article on cash farm income in 1938, with tables showing for 1937 and 1938 the cash income by crops and groups of livestock and livestock products and from Government payments, and by States the cash income from crops, livestock and livestock products, and Government payments.

Deciduous fruit statistics as of January, 1939, compiled by S. W. Shear (*California Sta. Mimeog. Rpt. 66 (1939), pp. [74]*).—This is a compilation of statistics as to State and national acreages, production, exports, imports, consumption, farm value, utilization, etc., of different deciduous fruits. Included are 13 general tables, 3 tables on plums, 4 each on dates and prunes, 5 each on apples, apricots, and cherries, 7 on peaches, 8 on figs, 9 on pears, and 10 on grapes.

RURAL SOCIOLOGY

[Investigations in rural sociology by the Iowa Station] (*Iowa Sta. Rpt. 1938, pt. 1, pp. 204–207*).—Topics discussed are an estimate of the farm population and movement to and from farms in Iowa (coop. U. S. D. A.), and the characteristics of persons receiving public and private old-age assistance in Iowa, both by R. E. Wakeley.

[Investigations in rural sociology by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1938, pp. 155, 156*).—Subjects reported upon include a survey of rural churches in Cortland County, by H. E. Hammer; and organization and uses of rural-community buildings in New York State, by W. M. Smith, Jr.

[Investigations in rural sociology by the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. 145–148*).—Topics discussed are the cityward movement of rural population, farming for unemployed miners, and effects of landownership on the farmer and his family.

[Investigations in rural sociology by the South Carolina Station] (*South Carolina Sta. Rpt. 1938, pp. 10–15, fig. 1*).—Among the subjects discussed are social mobility in the farming occupation, by B. O. Williams; social educational relationships, by H. L. Fulmer, G. H. Aull, and Williams; and studies in farm tenancy, by Williams and Aull (coop. U. S. D. A.).

[Investigations in rural sociology by the Wisconsin Station, 1938] (*Wisconsin Sta. Bul. 442 (1938), pp. 31–34, fig. 1*).—Subjects discussed are nationality groups, by G. W. Hill and G. S. Wehrwein, and unemployables on relief, by Hill and R. A. Smith (both coop. Works Progress Administration).

Low-income farms in West Virginia: A symposium (*West Virginia Sta. Mimeog. Circ. 32 (1938), pp. [1]+44, fig. 1*).—Included are the following papers: Implications of Low-Income Farm Families to State and Local Governments, by C. R. Orton (pp. 1, 2); Income From Agriculture and Relief to Farmers in West Virginia (pp. 3, 4) and Tax Payments of Farm Families Receiving Relief in Monongalia County Compared With Relief Expenditures (pp. 9, 10), both by W. W. Armentrout; Extent of Relief to Farm People in West Virginia, by A. W. Garnett (pp. 5, 6); Extent of Work Relief to Farm People in West Virginia, by J. N. Alderson (pp. 7, 8); The Extent to Which the West Virginia Agricultural Extension Service Reaches Low-Income Farmers of the State, by J. O.

Knapp (pp. 10–15); Assistance of Farm Security Administration to West Virginia Low-Income Farmers, by R. G. Ellyson (pp. 15–19), and What the Soil Conservation Service is Doing for Low-Income Farms, by L. L. Lough (p. 20) (both U. S. D. A.); The State Department of Agriculture, by J. B. McLaughlin (p. 21); The Agricultural Conservation Program and Low-Income Farms, by C. E. Stockdale (pp. 21, 22); and Opportunities Suggested by Staff Members of the Agricultural Extension Service and of the Agricultural Experiment Station for Aiding Low-Income Farms to Obtain a Larger Income (pp. 23–35). An appendix is also included.

Social problems in agriculture (*Internatl. Labor Off., Genève, Studies and Rpts., Ser. K, No. 14 (1938), pp. IV+162*).—This publication is a record of the Permanent Agricultural Committee of the International Labor Office and includes reports prepared by the International Labor Office concerning agricultural labor, debates at the first session of the Permanent Agricultural Committee, and the report of the Committee, including general discussion of agricultural labor, the standard of living and economic conditions in agriculture, the protection of the agricultural worker, and other questions.

Problems of rural life focused by the depression, D. Sanderson. (Cornell Univ.). (*Rural Sociol., 3 (1938), No. 3, pp. 258–266*).—The depression has affected rural life mostly on the economic side, but has given a larger place to the subsistence values of rural life, as well as impetus to soil conservation. County organization of rural social work, direct attack on the tenancy problem, and a strong movement for Federal aid to the common schools are other movements resulting from the depression. Farmers have become convinced of the necessity of collective action, but it has also become apparent that their interests are regional and that the integration of the opposing interests of different regions is essential for a national policy for agriculture.

Business cycles and age of operators as factors in the progress of Tennessee farmers, C. E. Allred and E. E. Briner (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 87 (1938), pp. [1]+III+30, figs. 12*).—This monograph discusses the accumulation of wealth by farm operators as influenced by economic cycles and age of the operator on the basis of 457 schedules secured in three counties representing the livestock, dark-fired tobacco, and cotton areas of the State. Unusually high prices during the World War period were accompanied by greater accumulations of wealth by farm operators of all tenures than during any other period covered by this study. Farm operators normally accumulate more per year after passing middle age, due to returns on capital saved and to smaller demands for family living. White and colored inheriting operators are similar in their patterns of wealth accumulation, but colored operators accumulate less than white operators. Owners were able to accumulate more than tenants in all periods considered in this study. Wealth accumulation by white inheriting owners is probably responsible to a large extent for the difference in current net worth existing between inheriting and noninheriting operators, between colored and white operators, and between owners and tenants.

Tenure by type of farming areas and color in Tennessee, C. E. Allred and E. E. Briner (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 85 (1938), pp. [1]+II+24, figs. 15*).—This study indicates that tenancy in Tennessee increased from 34.5 percent in 1880 to 46.2 percent in 1935, chiefly in west and middle Tennessee. There is no apparent race distinction based on tenure of farm operators. Concentration of tenants is associated with high labor-requiring cash crops, particularly cotton and tobacco. Colored croppers are concentrated in about the same localities as cotton, except those located in the

dark tobacco area. White croppers are widely distributed over the State, being somewhat fewer than colored croppers in the most intensive cotton area of southwestern Tennessee. Croppers operate land of the highest per acre value.

Inheritance as a factor in the progress of Tennessee farmers, C. E. Allred and E. E. Briner (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 88 (1938), pp. [1]+IV+38, figs. 24*).—The authors discuss the effect of inheritance on farm ownership and on tenure and wealth accumulation as revealed in studies in Madison, Montgomery, and Williamson Counties.

Of all operators studied, 44.4 percent had received an inheritance before the time of taking the record, and an additional 8.6 percent will yet inherit, making inheritance an important factor in the farm business of 53 percent of all cases. Of the owners, 64.2 percent had inherited compared with 21.3 percent of the tenants. This difference is due partly to age and partly to color. Of white operators, 55.1 percent had inherited compared with 18.7 percent of colored operators. The greater proportion of persons inheriting (57.8 percent) were 35 yr. of age and under. The average inheritance was about $1,000. The rate at which wealth was accumulated varied between tenure classes, between white and colored, between inheriting and noninheriting operators, and between counties. Lower tenure groups had a larger proportion of noninheriting than inheriting operators. Higher tenure groups were nearly equal in percentage of inheriting and noninheriting operators, except unencumbered owners of whom there were approximately 2.5 who had inherited to 1 noninheriting. Lower tenure groups contained more colored operators and fewer who had at one time been owners. Noninheriting operators spent more years in the lower tenures than inheriting operators. Nonfarm years in the operator's experience served as an important wealth-accumulating period. However, over half the net wealth accumulated during these years was from inheritance. More frequent and greater losses were reported while engaged in nonfarm pursuits. Inheritance appears to be an important factor in the return to the farm of families after engaging in nonfarm occupations.

State reforestation in two New York counties: The story of the land and the people, T. E. LaMont (*[New York] Cornell Sta. Bul. 712 (1939), pp. 23, figs. 3*).—This is a report of a study of persons who had sold land to the State in Chenango and Madison Counties, which shows how little social disturbance is created by a well-organized, unhurried, long-time purchase program. Of 363 parcels sold to the State before June 1935, 335 were in reforestation areas, and 28 in the Pharsalia Game Refuge. The average size of parcel was 140 acres. About 65 percent of the land sold was cleared. An average of 6 yr. elapsed from the time of moving from the farms sold to the time of selling the land to the State. Only 14 percent of the parcels sold to the State were occupied at the time sold, 8 percent by owners, 5 percent by tenants, and 1 percent by persons using the house only as a residence. Only 17 percent of the parcels sold were operated during the year before State purchase; 40 percent had been idle for 10 yr. or more.

In reforestation areas one-third of the parcels sold never had any house, and on these the house or barn was gone or falling on 61 percent. On only 21 percent did the former owners consider both the house and barn fair or good.

Of all those who sold land to the State in these areas only 6 percent said they would repurchase if given the opportunity, and only 3 percent said that they were worse off because of selling the land.

***Social aspects of farm labor in the South*, H. Hoffsommer.** (La. State Univ.). (*Rural Sociol., 3 (1938), No. 4, pp. 434–445*).—Farm labor in the South

comprises four major groups—(1) unpaid family workers; (2) year-round workers, including sharecroppers; (3) seasonal workers; and (4) migratory workers. As compared with the nation the Southeast has proportionately more unpaid family workers, more hired laborers when sharecroppers are included, greater seasonal variation in demand due to the one-crop system, and relatively few migratory laborers. The Southeast is also characterized by a dense agricultural population, a greater proportion of the gainfully employed in agriculture than elsewhere in the country, and a large amount of female agricultural labor, while the historical background of labor in the Southeast and the fact that 40 percent of the present agricultural laborers are Negro profoundly influences the whole structure of labor relations. The many problems involved are not subject to ready solution but must be comprehended in view of a planned agriculture, which should include labor as an integral part of the agricultural structure.

Social aspects of farm labor in the Pacific States, P. H. LANDIS. (Wash. State Col.). (*Rural Sociol., 3 (1938), No. 4, pp. 421–433*).—In the Pacific Coast States, which have long been accustomed to seasonal labor not only in agriculture but in lumbering and fishing, transient farm labor has become a problem of major proportions. Social legislation designed to underwrite the risks of the socially inadequate embraces chiefly the urban-industrial classes, even though the farm laborer on the West Coast has long been subject to as much exploitation and as much uncertainty in his mode of life as has any urban-industrial group. A highly unstable agricultural industry is not able to carry full responsibility for the security of farm laborers. Therefore, programs designed to stabilize agriculture should ultimately effect an improvement in the lot of the laborer. There is said to be room for a great deal of improvement in the social and economic conditions of the various types of agricultural workers, conditions which not only endanger health and general welfare but also threaten the West's reputation for social equality. Among the important gestures of groups interested in problems of farm labor are two recent measures of the U. S. D. A. Farm Security Administration—a socialized health program for the lower strata in agriculture in California, and the development, on an experimental basis, of a chain of sanitary farm labor camps up and down the coast, both of these programs being financed chiefly by the Federal Government.

Constructive measures for dealing with the South's population problems, C. C. TAYLOR. (U. S. D. A.). (*Rural Sociol., 3 (1938), No. 3, pp. 239–257, figs. 8*).—The four general types of adjustment suggested are the promotion of balanced farming or a maximum development of live-at-home farming, the expansion of manufacturing processes of many kinds, the encouragement of combined farming and industrial enterprises, and the intelligent guidance of the relocation of surplus population into both farming and industrial enterprises.

Depopulation of Louisiana's Sugar Bowl, T. L. SMITH. (La. State Univ.). (*Jour. Farm. Econ., 20 (1938), No. 2, pp. 503–509*).—The serious social consequences brought about by a depression in the sugarcane industry because of mosaic disease and other complicating factors are discussed. Although new varieties of cane were developed which were more resistant to disease and insects which preyed upon the sugarcane borer were discovered, propagated, and disseminated, much social wreckage resulted from the depression in the industry. Abandoned plantations and cabins; dismantled sugar houses; fertile and well-located lands out of cultivation; decadent towns, villages, and hamlets; business enterprises closed out, bankrupt, or in straitened circumstances; and

schools and churches struggling to maintain a semblance of their functions indicated the social effects better than statistics of production.

The depressed agriculture of the area has continued to employ about the same number of white people, and the towns and small cities in the area have absorbed part of their natural increase. Colored laborers on cane plantations, however, were left without employment, and the net result was that both urban and rural Negroes were forced to leave the cane area. The extent of their removal, 32 percent between 1910 and 1930, marks the extent of the depopulation in this region, as the white population gained 1.8 percent. It is expected that these Negro laborers will form the bulk of the re-employment with a revival of the sugar industry.

The possibility of a distinctive culture contribution from the American Negro, T. G. Standing. (Okla. A. and M. Col.). (*Social Forces, 17 (1938), No. 1, pp. 99–106*).—"Since emancipation there has developed a small but none the less significant middle class, and the proportion of educated persons within the group is rapidly increasing. Illiteracy has been reduced from 81.4 percent in 1870 to 16.3 percent in 1930. It is estimated that from 1826 to 1936 more than 43,000 Negroes have graduated from colleges and professional schools. This includes some 150 recipients of the Ph. D. degree. Since 1870 the value of property owned by Negroes has increased from $20,000,000 to $2,500,000,000. . . . Analysis of census data indicates an increasing degree of occupational diversification among Negroes. This trend has been especially pronounced during recent decades, although partially interrupted by the current depression."

Recent shifts in Negro occupations indicate the potential ability of the colored masses to succeed in occupations other than those assigned them by tradition, and this in turn tends to refute the assumption that the Negro is destined by nature to a limited or specialized cultural role. Notwithstanding a widespread belief to the contrary, it is by no means certain that a disproportionate number of American Negroes have achieved distinction in the artistic and literary fields. According to The Negro Year Book there are 12 Negroes listed in American Men of Science. Of the 100 included in the 1936–37 edition of Who's Who in America the majority are clergymen, and only 5 represent what could properly be termed artistic pursuits. Relatively few colored persons have become outstanding in business, industry, or science, but there are enough exceptions to indicate that lack of ability in these lines is not a racial trait.

In view of the wide diversity of the Negro's chief contributions to date, there is reason for distrusting the theory that his cultural choices are determined by a peculiar racial temperament. Negro groups and communities, especially in urban areas, are noted where the institutional forms are indistinguishable from those of the whites. Racial prejudice and segregation have had the effect of throwing the Negro more and more upon his own resources and as a result he is developing a racial consciousness and a corresponding sense of racial pride and self respect. Since Negroes and whites seem destined to live together for an indefinite period, the author concludes that it would be extremely unfortunate if such a development should obscure their fundamental identity of interests.

The composition of rural households, W. A. Anderson ([*New York*] *Cornell Sta. Bul. 713 (1939), pp. 24, figs. 4*).—This study describes the composition of the rural households of Genesee County, N. Y. The sample includes 2,925 households, about 80 percent of all households in the open-country area of the county. Of these households, one-half are composed of husband, wife, and children, and one-sixth include only husband and wife. One in 8 consists of a

married couple, children, and other persons, and 1 in 10 is a broken family household of 1 parent with children and other persons. In addition, in 1 of each 30 households no marital ties exist between the household members, and 1 in 40 is constituted only of an unmarried man or woman.

Human and physical resources of Tennessee.—XXXIII, County government. XXXIV, Municipal government, C. E. ALLRED, S. W. ATKINS, and L. P. BOHANAN (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Monog. 86 (1938), pp. [1]+VI+524–555, figs. 15*).—In Tennessee the county is an administrative unit of the State and a unit of local self government, performing functions that are of both State and local concern. In 1935 there were 71 Tennessee counties with less than $10,000,000 assessed valuation. Over 90 percent of the tax revenue came from the general property tax while 82 percent of nontax revenues came from State and Federal funds. Forty-three percent of total expenditures by county governments was for schools in 1932, but more money is spent for interest on indebtedness than for outlays. Total indebtedness of all Tennessee counties increased from $16,521,000 in 1912 to $104,322,000 in 1932.

There are three types of municipal government in Tennessee—mayor-council, commission, and city-manager. Cities and towns have only those powers delegated to them by the State legislature. Per capita receipts and expenditures of municipal governments tend to increase directly as the population of the unit increases. Ninety percent of tax revenue for municipal government is raised from property tax. Towns and cities in Tennessee had an average net debt of $115 per capita in 1932.

Rural community patterns of social participation, O. F. LARSON. (Colo. State Col.). (*Social Forces, 16 (1938), No. 3, pp. 385–388*).—A survey of seven representative Minnesota town-country communities was made in the fall of 1934 by interview of a random sample of 1,350 out-of-school persons 15 yr. of age and over, 100 from each village center in all cases but one, where half as many were secured, and 100 from the open country service area of each village. The average monthly attendance was secured for participation in formally organized group activities, following with slight deviation the classification of major types used by Brunner and Kolb (E. S. R., 69, p. 299).

The data imply a need for demanding an elastic and individualized community treatment rather than an iron-clad blanket application of procedures and policies as conceived by some centralized authority. About one in six of the sample population did not attend any form of organized activity as frequently as an average of once a month. A smaller proportion of farm people than villagers participated in each type of activity, and farm people had only 62 percent as great a total volume of attendance as village people. More males than females participated in athletic and socio-economic activities, while the reverse was found for educational, social, and socio-religious affairs. Activities associated with institutionalized religion dominated organized participation in rural communities, accounting for 71 percent of all attendances. Such activity was more important for farm than village people, being 83 and 63 percent, respectively, of all contacts. Younger people were more active participants than their elders. Persons aged from 15 to 34 yr. had about 10 percent more participation than "expected," while the groups 35 and over had less than "expected," with the difference steadily increasing until the group 65 and over had almost 15 percent less attendance than would be assumed from their proportion in the sample population.

Criteria of rural community formation, D. SANDERSON. (Cornell Univ.). (*Rural Sociol., 3 (1938), No. 4, pp. 373–384*).—The rural community is an emer-

gent sociological concept. The use of the rural community as the school attendance unit will tend to institutionalize it. Rural school consolidation may seriously impair rural community life if based solely on so-called efficiency. Four criteria for the areas of rural communities are advanced as a means for obtaining constructive discussion. These are based on the ideas of relative self-sufficiency, opportunity for personal association, and pooling of resources for desired institutions. The development of such standards and the mapping of rural communities is an important function of State and county planning boards and should be made a feature of the county land use planning committees being established by the agricultural extension services.

Diagnosing rural community organization, D. Ensminger. (Cornell Univ.). (*Rural Sociol., 3 (1938), No. 4, pp. 410–420*).—The individuality of a rural community may be characterized according to (1) village-farm relationships as being adolescent, mature, or debilitated; (2) degree of organization as being underorganized, overorganized, or disorganized; (3) organizational interaction as being circumscribed, conflictive, or cooperative; (4) assimilative character of a community as being efficient or inefficient; (5) community self-sufficiency as being inadequate, partial, or adequate; (6) leadership as being personal, positional, or organizational; (7) community self-identification as being geographical distinction, history and tradition, competition or conflict with other communities or outside pressures, or divided loyalties; and (8) community activities and events as being community supported activities, activities without community interest, or interest and activities lacking.

Status of research pertaining to situations and problems among rural young people, E. L. Kirkpatrick (*Washington, D. C.: Amer. Youth Comn., Amer. Council Ed., 1938, pp. [2]+12*).—"One-fourth of the experiment stations have studies underway. Most of these apply specifically to older youth, while others are in the field of population migration or rural relief but give secondary attention to young people and their problems."

Taking stock of rural youth, B. L. Melvin and E. N. Smith (*Social Forces, 17 (1938), No. 2, pp. 167–174*).—"The future of American rural life . . . rests on increased industrial production, a closer integration of industry and agriculture, and an expansion of the cultural and human services so badly needed in rural society."

Our present knowledge of assortative mating, C. A. Anderson. (Iowa State Col.). (*Rural Sociol., 3 (1938), No. 3, pp. 296–302*).—Assortative mating is said to deserve inclusion in research projects on the family. Evidence is summarized to support the hypothesis that "free choice" leads to mating of like with like for all those criteria of choice which have been studied. The type of selectivity involved in friendships and other intimate associations strengthens this hypothesis. The factors in actual matings which facilitate or hinder this analytically abstract tendency are discussed. These modifications reveal many essential features of the family and of the society studied.

Human and physical resources of Tennessee.—XXIX, Health. XXX, Welfare work, C. E. Allred, S. W. Atkins, and R. G. Milk (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 83 (1938), pp. [1]+VII+458–495, figs. 12*).—The authors show that the annual cost of medical care in Tennessee exceeds $24 per capita. The State has a growing population, births exceeding deaths by 7.7 births per 1,000 population. Whites have a higher birth rate than Negroes, the latter being actually on the decrease. There were 461 fewer physicians in 1938 than in 1923. In 1937 there were 3,000 persons per dentist for the State, but in 9 counties this number was 20,000 persons per dentist, and there were no dentists in 8 counties. There were 97 hospitals in 1937,

providing the State with 5.2 hospital beds per 1,000 people. This was the sixth lowest figure in the country and considerably below the United States average of 8.7 beds per 1,000 people. The amount spent per capita for health and sanitation work by the State and local governments in 1936 amounted to 46 ct. and was exceeded by 45 States.

The characteristics and mobility of rural physicians: A study of six Wisconsin counties, H. Maslow (*Rural Sociol., 3 (1938), No. 3, pp. 267–278*).—In the area selected, during a 24-yr. period the population changed but little, but the number of physicians in proportion to the population decreased by 23 percent, this resulting from a movement of 203 physicians into the area, 156 out, and 82 deaths or retirements. An average mobility rate of over 11 percent a year was found. The mobility rate was greater in the older age groups and in the smaller communities. A considerable number of physicians were graduates of low-grade medical schools, but the proportion of these substantially decreased during the period. The trend from 1912 to 1936 was toward an older average age. Over half of the physicians moving into the area during this period were not recent graduates but came from other places of practice—about two-thirds coming from rural places (under 2,500 population) and only about one-third from cities. Of the recent graduates who moved into the area between 1912 and 1936, a higher percentage eventually moved away than remained.

Rural housing problem in the South, S. H. Hobbs, Jr. (Univ. N. C.). (*Rural Sociol., 3 (1938), No. 3, pp. 279–295*).—Chief factors responsible for the long-standing rural housing problem in the South are climate, farm income, high Negro ratios, farm tenancy, and small farms. This problem has received scanty attention, and much pessimism exists as to possibilities of remedying rural housing conditions, especially for low-income farm groups. The main suggestions are to subsidize housing for low-income groups, extend Federal Housing Administration into rural fields, carry on work begun by the Resettlement Administration, expand the program of the U. S. D. A. Farm Security Administration, and encourage self-help among farmers themselves through educational programs and otherwise. The author thinks that a modification of the plan whereby some 60,000 cottages were erected for farm laborers in Ireland could be employed as a partial solution.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Building rural leadership (*U. S. Dept. Agr., Ext. Serv., 1939, pp. 76*).—This is a report of the extension work in agriculture and home economics in 1935. The assistance to the A. A. A., the new fields of work, the activities with crops, the improvement of flocks and herds, farm engineering activities, the work with homemakers in 4–H Clubs, the work with Negroes in adjusting farm and home practices and in 4–H Clubs, and the work on extension education through motion pictures, short courses, demonstrations, radio broadcasts, charts, etc., are described. An appendix includes statistics as to results of the work, and the work with boys and girls by projects and by States by projects as to expenditures from Federal appropriations and from funds within the States. The data for results are for the year ended November 30, 1935, and those for appropriations for the fiscal year ended June 30, 1935.

4-H Club work: Effect on capability and personal quality, D. E. Lindstrom and W. M. Dawson (*Illinois Sta. Bul. 451 (1939), pp. 273–343, figs. 10*).—Using the same group of 2,263 boys and girls as in a previously noted (E. S. R., 76, p. 289) study on factors influencing 4–H Club membership, the increase in capability resulting from 4–H Club work was studied. This increase was especially

noticeable among the boys who had taken no agriculture in high school but who had carried on beef, sheep, or corn 4–H Club projects and among the girls who had not had home economics in high school. Interest in the possibilities of farming and farm life was associated with achievement, and members of 4–H Clubs, both boys and girls, had in general a more appreciative attitude toward farm life than nonmembers. Members of 4–H Clubs, both boys and girls, gave indications of having greater social-mindedness and more leadership ability than nonmembers, but it was not possible to determine whether the difference was due to 4–H Club training or to selectivity.

Scoring judging contests, H. S. Brunner (*Pennsylvania Sta. Bul. 367 (1938), p. 57*).—The correlations between final placings and total scores found in a study of reliability of the judging contest score card now in use are given and commented on.

FOODS—HUMAN NUTRITION

[Nutrition studies by the Alabama Station] (*Alabama Sta. Rpt. 1937, pp. 20–23, fig. 1*).—Progress reports (E. S. R., 78, p. 880) are given on studies by W. D. Salmon on the relation of unsaturated oils and fatty acids to rat acrodynia or vitamin B_6 deficiency; by C. O. Prickett, Salmon, and G. A. Schrader on the peripheral nerves in acute and chronic vitamin B_1 deficiency; and by W. C. Sherman on the carotene content of green and mature soybeans and cowpeas and on the effect of oils on the utilization of carotene by rats.

[Studies in foods and nutrition by the Iowa Station] (*Iowa Sta. Rpt. 1938, pt. 1, pp. 62–65, 122, 155–162, fig. 1*).—The work covered by these progress reports, for the most part representing an extension of earlier work (E. S. R., 79, p. 560), includes field and cooking trials on 46 varieties of vegetable soybeans and 4 standard varieties of field soybeans, by C. P. Wilsie, P. M. Nelson, and B. Lowe (pp. 62–65); tests for the inactivating action on vitamin A in butterfat by various edible oils, the antioxidant effect of thymol on open-kettle lard, Mazola, and soybean oil, and the effect of various treatments on the inactivating power toward vitamin A of Mazola, by V. E. and P. M. Nelson and Lowe (p. 122); studies on the nature of the dietary deficiency causing progressive retardation of growth in successive generations of rats, the biological value of autoclaved pork muscle, dietary factors in the production and cure of toxemic pregnancies induced by the feeding of certain pork diets, and the lactogogue factor in liver and beef muscle, by P. Swanson and P. M. Nelson (pp. 155–159); certain phases of the cooperative project on the nutritional status of college women as related to their dietary habits, including the standardization of technics for measuring red cell volume and hemoglobin, a study of the basal metabolism data on freshmen and sophomore students, scores of food intake records of freshmen and upperclassmen students, and a continuation of the long-time balance study of a single subject, by P. M. Nelson and M. A. Ohlson (pp. 159–161); and the effect on palatability and tenderness of poultry of different chilling and freezing treatments, by P. M. Nelson, Lowe, and Wilsie (pp. 161, 162).

[Foods and nutrition studies by the Maine Station] (*Maine Sta. Bul. 391 (1938), pp. 261–267, 287, 288, 320, 321*).—These progress reports (E. S. R., 79, p. 129) summarize an extension of the investigation on food habits and nutritional status of children in selected communities in Maine, by M. M. Clayton (pp. 261–263); on the relation of man and animals to the environment, including an experimental and economic analysis of food getting, by W. F. Dove, and the selection of genetic strains of fruits and vegetables high in mineral and vitamin content, by E. F. Murphy and Dove (pp. 263–267); and

on cooking quality of potatoes, including cooking tests on the relation of net necrosis to cooking quality in general, by M. D. Sweetman (pp. 287, 288). A summary is also given of a study by J. McIntosh on factors affecting the vitamin C content of tomatoes and rutabagas (pp. 320, 321).

[Nutrition studies in Pennsylvania] (*Pennsylvania Sta. Bul. 367 (1938), pp. 6, 7, 45, 46, fig. 1*).—Notes are given on work by R. A. Dutcher and N. B. Guerrant on the loss of vitamin A in Cheddar cheese during curing and the curative value of yeast concentrates, determinations by A. K. Anderson of the hemoglobin and red cell content of blood and of the effect of dried yeast on the uric acid content of blood and urine, and by P. B. Mack and J. Smith on the dietary habits and nutritional status of the members of 100 families with widely varying incomes.

[Food consumption studies by the South Carolina Station] (*South Carolina Sta. Rpt. 1938, pp. 27–31, fig. 1*).—This progress report (E. S. R., 79, p. 417) includes summaries of the completed studies by A. M. Moser on food consumption of farm families in the lower Coastal Plains region and by M. E. Frayser on the production and consumption of dairy products by farm households.

[Foods and nutrition research of the Texas Station] (*Texas Sta. Rpt. 1937, pp. 27, 140–142*).—Progress reports extending earlier work (E. S. R., 79, p. 129) are given by G. S. Fraps, R. Treicher, A. R. Kemmerer, and W. W. Meinke on the effect of different planes of carotene intake as the sole source of vitamin A on the health and longevity of rats; by J. Whitacre, L. R. Hawthorn, and S. H. Yarnell on factors affecting the storage of cucumbers; by Whitacre on the effect of tea upon the energy metabolism of children; by S. Cover on the effect of oven temperatures on the tenderness of meat; and by Cover, R. D. Turk, and H. Schmidt on the processing of canned meat.

[Studies in foods and nutrition by the Wisconsin Station] (*Wisconsin Sta. Bul. 442 (1938), pp. 36–40, 77–80, 80–83, 92, 93, 96–98, 99–101, figs. 2*).—Included in this progress report are summaries of studies, several of which represent extensions of earlier work (E. S. R., 78, p. 881) or have been noted previously. Among them are studies by H. Parsons, D. Johnson, and A. L. Marlatt in cooperation with G. M. Briggs and O. B. Combs on the effect of various processing temperatures on the nutritive value of the proteins of green edible and dry field soybeans (pp. 36, 37); by Parsons and E. Katz on the vitamin C content of several varieties of Wisconsin-grown apples (pp. 37, 38); by Parsons, E. Weagley, E. Slossmann, V. Helmke, and I. Baumann on the keeping quality and vitamin C content of home-made sauerkraut in sealed fruit jars (p. 38); by D. Husseman on the effect of season on the vitamin C content of tomatoes and of methods of preparation on the vitamin C content of home-canned tomato juice (pp. 38, 39); by Parsons, Johnson, L. Arent, and M. Sanders on the cause of egg white injury (pp. 39, 40); by H. A. Schneider and H. Steenbock on the production of kidney stones in rats kept on a low phosphorus diet (p. 77); by C. Krieger and Steenbock on the mechanism by which animals make use of phytic acid (pp. 77, 78); by A. C. Elvehjem and H. D. Anderson on the effect of the calcium-phosphorus intake on the utilization of iron (pp. 78, 79); by E. Van Donk and Steenbock on the need of vitamin A for satisfactory storage of iron (p. 79); by G. O. Kohler, Elvehjem, and E. B. Hart on attempts to treat nutritional anemia in rats with chlorophyll (p. 80); by E. J. and J. G. Lease, J. H. Weber, and Steenbock on factors affecting the utilization of vitamin A (pp. 92, 93); by W. Dasler and Steenbock on factors influencing the yield of vitamin D from ergosterol (pp. 96, 97); by J. J. Oleson, H. R. Bird, Elvehjem, and Hart on the factor in the vitamin B complex responsible for the prevention and cure of "spectacle eye" in rats

(pp. 97, 98); by Schneider, K. Ascham, and Steenbock on the distribution of vitamin B_6 in certain foods and Steenbock and F. Quackenbush on the identification of the active principle (p. 99); by D. V. Frost and Elvehjem on the possible complexity of factor W (pp. 99, 100); by M. A. Lipton, V. R. Potter, and Elvehjem on the role of vitamin B_1 in the synthesis of cocarboxylase and its significance in nutrition (p. 100); by F. E. Stirn, A. Arnold, and Elvehjem on the sparing action of fats for vitamin B_1 (pp. 100, 101); and by Elvehjem, O. Mickelsen, and H. A. Waisman on the effect of various methods of cooking on the vitamin B_1 content of meat products (p. 101).

The structure and composition of foods.—IV, Sugar, sirup, honey, tea, coffee, cocoa, spices, extracts, yeast, baking powder, A. L. and K. B. Winton (*New York: John Wiley & Sons; London: Chapman & Hall, 1939, vol. 4, pp. XXXIII+580, figs. 134*).—In this volume, which continues the series noted previously (E. S. R., 78, p. 719), the general plan of the foregoing volumes has been followed in discussing the relation of structure to the composition of saccharine and alkaloidal products, spices and extracts, and leaven.

The effect of the method of heat application, and accompanying oven conditions, upon flavor and texture of baked foods, M. M. Monroe and P. S. Greene (*Maine Sta. Bul. 391 (1938), pp. 277–279*).—This progress report summarizes data on oven temperatures required for heat absorption in glass and metal pans and the effect of oven air moisture on the consumption of electricity in thermostatically controlled ovens.

The preservation of fruits and vegetables in cold storage lockers, D. Knowles (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 3, pp. 19–25*).—This is a summary of available information from various sources on the types and varieties of fruits and vegetables suitable for small-scale freezing for locker storage, their selection and preparation for freezing, the best temperature for freezing and storage, and methods for using the frozen products, including directions for cooking frozen vegetables. Convenient tables are included on the principal kinds of fruits and vegetables usually adaptable for freezing, the temperature and time for scalding certain vegetables, and the entire procedure for freezing different kinds of fruits and vegetables.

Food planning for four hundred millions, Radhakamal Mukerjee (*London: Macmillan & Co., 1938, pp. XVIII+267, figs. 6*).—The author surveys the trend of food supply in relation to population increase in India and compares the diets of the people in different regions and classes with various standards of nutrition. In addition to discussions on crop planning and nutrition and ways of adapting agricultural production to population pressure, the various social factors which contribute to increase of population are considered.

Diets of families of employed wage earners and clerical workers in cities, H. K. Stiebeling and E. F. Phipard (*U. S. Dept. Agr. Circ. 507 (1939), pp. II+141, figs. 9*).—The nutritive adequacy of the diets of 2,272 white and 222 Negro families in 43 industrial centers in 8 major geographical regions of the United States was calculated from dietary records obtained by the Cost of Living Division of the U. S. Bureau of Labor Statistics. In using the information on the kind, quantity, and money value of the food secured in 1 week during the period of December 1934 to February 1937, no deductions were made for waste of edible food. The white families had incomes ranging from \$3.48 to \$15.51 and the Negro families from \$2.96 to 9.08 a person a week.

The families were grouped in eight classes on the basis of food expenditures a person a week, ranging from less than \$0.63 to \$4.38 and over, the intervals used in the classification having been adjusted to the 1935 levels of retail food costs. The middle half of the 282 white families in the East South Central

cities spent from $1.60 to $2.75 a person a week for food as compared to from $1.85 to $3 by the median families of the 39 West South Central families, from $2 to $3 by those of the 76 Rocky Mountain region families, $2 to $3.10 by those of the 98 South Atlantic families, from $2.10 to $3.35 by those of the 381 East North Central families, from $2.15 to $3.50 by those of the 843 North Atlantic families, from $2.20 to $3.60 by those of the 112 West North Central families, and $2.25 to $3.60 a person a week by the middle half of the 441 Pacific region white families. The middle half of the 222 Negro families spent from $1.05 to $2.15 in the southern cities and from $1.75 to $3.65 a person a week in the Middle Atlantic cities.

When the diets were classified according to their nutritive content per requirement unit, as adopted by the Bureau of Home Economics, 11 percent of the white families in the North Atlantic cities were obtaining a good diet, 32 a fair, and 57 percent a poor diet, as compared to 12, 28, and 60 percent, respectively, for the East North Central families; 21, 33, and 46 percent, respectively, for the East South Central families, and 14, 46, and 40 percent, respectively, for the white families in the Pacific region. Eleven percent of the Negro families were obtaining a good diet, 25 a fair, and 64 percent a poor diet. The diets were in definite need of improvement with respect to one or more nutrients when the white families spent less than $1.60 a person a week for food in the Pacific and North Atlantic cities, $1.55 in the East North Central, and $1 in the East South Central cities, and when the Negro families spent less than $0.95 a person a week. The comparison did not include the more limited data on the diets of the families in the other four regions.

The white families spent from one-fourth to one-third of their food money for eggs, lean meat, poultry, and fish; from one-fifth to one-fourth for vegetables and fruits; and from one-eighth to one-sixth for milk and cheese. The Negro families spent about one-third for eggs, meat, poultry, and fish; one-sixth for fruits and vegetables, and only 6 percent for milk. The remainder was expended largely for grain products, fats, and sugars. As the expenditures for foods increased, there was a more liberal use of milk, meat, eggs, green vegetables, and fruits. Of every 10 white families spending enough to obtain a fully adequate diet, only from 2 to 4 were selecting good diets. Among the Negro families the proportion was a little over 3 out of 10.

Arsenic in the nutrition of the rat, E. Hove, C. A. Elvehjem, and E. B. Hart. (Wis. Expt. Sta.). (*Amer. Jour. Physiol., 124 (1938), No. 1, pp. 205–212, fig. 1*).—In continuation of previous studies (E. S. R., 62, p. 688), the authors report that the administration of 1 or 5 μg. of arsenic per day to young rats receiving a milk diet with manganese and iron or iron and copper supplements did not affect growth, hemoglobin levels, or red blood cell count and fragility during a 6-week test period. Upon the withdrawal of the mineral supplements the anemic rats receiving arsenic showed a slight initial delay in the fall of the hemoglobin level. It is concluded that if arsenic is required by the rat during the growing period or for the building of hemoglobin or red blood cells the requirement is met by the approximately 2 μg. of arsenic contained in the 50-cc. daily intake of milk.

Aluminum in the nutrition of the rat, E. Hove, C. A. Elvehjem, and E. B. Hart. (Wis. Expt. Sta.). (*Amer. Jour. Physiol., 123 (1938), No. 3, pp. 640–643.*)—Three groups of rats on a whole milk diet supplemented with iron, copper, and manganese salts were given 0, 10, and 30 μg. of aluminum as aluminum sulfate per day. Assuming a 50-cc. daily milk intake, each rat received from 1 to 1.5 μg. of aluminum per day from the milk. Analyses of the blood and livers of the rats showed that the aluminum was absorbed from the intestinal

tract, removed fairly rapidly from the blood stream, and stored in the liver. Reproduction and the oestrous cycle were not affected. The aluminum exerted a very slight stimulating effect on the growth of some of the rats during the 6-week period following weaning. It is concluded that if the growing rat needs aluminum the 1 μg. per day contained in the milk intake meets the requirement.

Iron deficiency in pregnant rats: Its effect on the young, H. L. Alt (*Amer. Jour. Diseases Children, 56 (1938), No. 5, pp. 975–984*).—Observations were made before and after one and two pregnancies on female rats maintained on a whole milk powder diet, with and without iron and copper supplements, and on the newborn offspring.

One to 4 days before the first delivery the hemoglobin values averaged 12.9 gm. per 100 cc. for the rats receiving no supplement, 11.9 gm. with 0.5 mg. copper, 11.6 with 5 mg. iron, and 13 gm. for the rats receiving both iron and copper supplements. At 21 days post partum the hemoglobin values of the four groups averaged 12.4, 12.6, 14.6, and 14.8 gm. per 100 cc., and the iron content of the liver was 5.8, 5.7, 25.2, and 28.2 mg. per 100 gm. respectively. The erythrocyte counts were from 6.4 to 7.4 million before delivery and from 7.8 to 8.5 million per cubic millimeter at 21 days post partum. Just before delivery in the second pregnancy the hemoglobin values averaged 9.9 gm. per 100 cc. for the rats receiving no supplement and 11.2 gm. for the group receiving the copper supplement, and at 21 days post partum the values had decreased to 9.1 and 8.4 gm. respectively. The liver iron content was 5 and 5.2 mg. per 100 gm., respectively. The erythrocyte count was 7.7 and 7.4 million per cubic millimeter for the two groups before delivery and 8.9 and 9.2 million, respectively at 21 days post partum.

The first litter offspring of female rats with mild iron deficiency had a normal hemoglobin content, but their liver stores of iron were depleted. A moderate deficiency of iron in the mothers resulted in anemia in the newborn, with hemoglobin values reduced about 25 percent from the normal value and the total iron content of the body reduced by more than 50 percent. The administration of copper supplement to the pregnant rats did not prevent the occurrence of anemia in the offspring, but the administration of iron and copper completely protected the young against iron deficiency. The erythrocyte counts for the newborn rats did not vary significantly. In the second litter offspring the iron deficiency was much more severe, with hemoglobin values of 6.6 gm. per 100 cc. and the total body iron content decreased to almost one-fourth normal at birth, with markedly decreased erythrocyte counts. The hemoglobin values of some of the offspring of both litters, which averaged 9.9 gm. at birth, increased slightly for a few days and then gradually decreased to about 6.4 gm. per 100 cc. at the end of 18 days, which does not represent pathologic anemia for rats of this age group.

The quantitative requirement of vitamins of different species as a function of their size [trans. title], P. Meunier and Y. Raoul (*Compt. Rend. Soc. Biol. [Paris], 129 (1938), No. 34, pp. 1078–1080, fig. 1*).—On the basis of estimated requirements of different species for the various vitamins, the authors have plotted logarithmic curves from the weights of the species as abscissas and the estimated vitamin requirements as ordinates. From the straight line curves thus produced it has been concluded that the daily dose of vitamin producing analogous effects in comparable animals can be determined from the formula $v=KM^{3/4}$, where v=*quantity of vitamin*, K *a constant which is different for* each vitamin, and *M* the weight of the animal in question.

Influence of avitaminoses on weights of endocrine glands, B. Sure (Univ. Ark.). (*Endocrinology, 23 (1938), No. 5, pp. 575–580, fig. 1*).—A brief

report, with tabulated data, is given of a comparison of the weights expressed as percentages of body weight of the pancreas, adrenals, thymus, thyroid, and pituitary of rats on diets deficient in various vitamins with the weights of corresponding glands of controls restricted to the same plane of nutrition. An increase in the endocrine weights of the pathological animals over corresponding weights of the controls is referred to as hypertrophy and a decrease as atrophy. The most significant observations were hypertrophy of the pancreas in vitamin A-deficient rats, of the thyroids and adrenals in vitamin B_1-deficient rats, and of the pituitary in B_1- and G-deficient rats. Atrophy of the thymus occurred in all the vitamin B_1-deficient rats studied.

Effect of vitamin A deficiency on the rate of apposition of dentin, I. SCHOUR, M. C. SMITH, and M. M. HOFFMAN. (Univ. Ill. and Univ. Ariz.). (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 3, pp. 447–450, fig. 1*).—The daily rate of apposition of dentin was studied in 60 rats on a vitamin A-deficient diet by giving two intraperitoneal injections of 0.5 cc. of a 2-percent solution of alizarin Red S and measuring, in ground sections of incisors, the distance between the depositions of alizarine and dividing this by the time interval.

Within from 9 to 19 days the average daily rate of apposition was from 16.14μ to 19.63μ in the labial, from 11.14μ to 14.38μ in the distolingual, from 9.01μ to 13.76μ in the mesiolingual, and from 6.43μ to 13.42μ in the midlingual portions of the incisors. Within from 1 to 5 days after the administration of cod-liver oil to 7 of the rats the rate of apposition returned to the normal rate of about 16μ. The authors suggest the possible use of the reaction as a biologic method of measuring the vitamin A content of foods.

Production of renal calculi in guinea pigs by feeding them a diet deficient in vitamin A, M. STEINER, B. ZUGER, and B. KRAMER (*Arch. Path., 27 (1939), No. 1, pp. 104–114, figs. 4*).—In view of the uncertainty concerning the role of vitamin A deficiency in the formation of renal calculi as previously studied on rats, the authors used guinea pigs as experimental animals and obtained evidence of renal and urethral calculi in 9 out of 35 animals on a diet deficient in vitamin A alone and in none of 24 animals on diets adequate in vitamin A. The histological sequences in the pelvis and ureter from normal uroepithelium to stratified, keratinized epithelium are described, with illustrative microphotographs. The deficiency apparently caused hyperplasia at first, then metaplasia, and finally atrophy of pelvic and ureteral mucosa, large plaques of desquamated epithelium acting as the niduses for the development of calculi. Analyses of the calculi indicated that the inorganic fraction consisted entirely of calcium carbonate.

Vitamins and vitamin deficiencies.—I, Introduction and historical vitamin B_1 and beri-beri, L. J. HARRIS (*London: J. & A. Churchill, 1938, vol. 1, pp. XIV+204, figs. 50*).—This volume, which has a foreword by F. G. Hopkins, is the first of a series planned to provide a comprehensive synopsis of the results of modern research on each of the known vitamins. As the introductory volume to the series, it contains a brief historical section on the discovery of vitamins and their separation and naming. The three sections in which the material on vitamin B_1 is presented deal, respectively, with beriberi as a vitamin B_1 deficiency disease and the related types of polyneuritis, with prophylaxis and treatment; the concentration, isolation, physical and chemical properties, and synthesis of the vitamin, alternative methods for its estimation, its occurrence in foods, and its storage and metabolism in the body; and nutritive functions, with special emphasis on the relation of vitamin B_1 to carbohydrate metabolism. Literature references are given at the end of each chapter.

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Vitamin C and chlorophyll [trans. title], A. MIRIMANOFF (*Compt. Rend. Acad. Sci.* [*Paris*], *206* (*1938*), *No. 10, pp. 766–768*).—Using the Meunier electrophotometric method of determining ascorbic acid, the author has compared the content of the vitamin in corresponding green and white leaves and in various structural parts of plants, with the conclusion that richness in ascorbic acid in vegetable material is primarily a function of the anatomical structure of the plant and is not dependent upon chlorophyll per se, although it is thought probable that photosynthesis has some influence on the elaboration of the vitamin. In illustration, green and white leaves of lettuce gave values of 11.2 and 16 mg., brussels sprouts 67 and 69, and iris 178 and 201 mg., respectively, per 100 gm. of fresh plant. Beans germinated in the light had a content of 116 mg. in the green leaves and 12.1 mg. per 100 gm. in the green stems, and those germinated in the dark 84 and 13.5 mg. per 100 gm., respectively.

Losses of vitamin C during boiling and steaming of carrots, F. FENTON, D. K. TRESSLER, S. C. CAMP and C. G. KING. (Cornell Univ. and N. Y. State Expt. Sta. et al.). (*Food Res.*, *3* (*1938*), *No. 4, pp. 403–408*).—In continuation of previous studies (E. S. R., 80, p. 139), the authors determined the ascorbic acid content of carrots (Chantenay variety), using the Mack and Tressler modification (E. S. R., 78, p. 154) of the indophenol titration method. The fresh raw carrots contained from 0.044 to 0.069 mg. of ascorbic acid per gram. After boiling in water for 15 min. the sliced carrots had retained about 56 percent of the original content, the cooking water contained 33 percent, and 11 percent of the ascorbic acid content had been destroyed. A 20-min. steaming process removed only 14 percent of the ascorbic acid content from thinly sliced carrots.

Losses of vitamin C during commercial freezing, defrosting, and cooking of frosted peas, F. FENTON and D. K. TRESSLER. (Cornell Univ. and N. Y. State Expt. Sta.). (*Food Res.*, *3* (*1938*), *No. 4, pp. 409–416*).—In continuation of a series of studies (E. S. R., 80, p. 427) and following the Mack and Tressler modification (E. S. R., 78, p. 154) of the indophenol titration method, the authors determined the vitamin C content of raw and cooked frosted peas of the Thomas Laxton variety and compared the values with those obtained previously (E. S. R., 79, p. 138) for cooked fresh peas of the same variety.

The fresh raw peas contained 0.25 mg. of ascorbic acid per gram and the frozen peas 0.18 mg. per gram. A loss of about 38 percent occurred during blanching, chilling, and packaging of the peas. The cooked frosted peas taken directly from storage at −40° F. retained 59 percent of the ascorbic acid content, and 36 percent was dissolved in the cooking water. The cooked frosted peas after refrigeration for 16 hr. at 40° F. retained 56 percent, with 39 percent of the ascorbic acid content dissolved in the cooking water. The ascorbic acid content of the cooked frosted peas was 0.12 mg. as compared to 0.11 mg. per gram for cooked fresh peas of the same variety.

Studies in the use of crystalline vitamin C (ascorbic acid) in the prohpylaxis and treatment of infantile scurvy and some other disorders of infancy and childhood, A. S. KENNEY and M. RAPOPORT (*Jour. Ped.*, *14* (*1939*), *No. 2, pp. 161–182, figs. 16*).—Miscellaneous observations on the use of crystalline vitamin C are reported as follows:

In doses of 1.83 mg. per kilogram of body weight daily for a period of 5 mo. crystalline ascorbic acid afforded complete protection from clinical or roentgenological evidence of scurvy in infants. The total quantity required to produce a degree of healing in scurvy resulting in freedom from pain and tenderness in the legs varied from 100 to 500 mg., with an average of 310 mg. With both ascorbic acid and orange juice, longer periods were required before healing could be noted in X-ray examination. A suggested treatment of

scorbutic infants with crystalline vitamin C is to give a daily dose of 500 mg. for 4 days to produce a condition of saturation and then a daily maintenance dose of from 25 to 50 mg. The administration of crystalline ascorbic acid caused no apparent temperature elevation in afebrile subjects.

In three of five anemic infants free from infection upon whom blood studies were made during ascorbic acid therapy, definite improvement in the blood picture occurred. In two others there was no response in the hemoglobin or red cells. The authors are inclined to think that when the iron reserves of the body are not so depleted that iron is no longer available for hemoglobin formation vitamin C has a favorable effect on hematopoiesis, and suggest that the failure of some anemic infants and children to respond to iron therapy may be due to inadequate vitamin C intake. In six scorbutic infants showing an increase in the size of the heart there was a marked degree of anemia. In one observed after cure of the scurvy no decrease in the heart size was evident. This is thought to suggest that factors other than vitamin C deficiency may be operative in producing the cardiac enlargement noted.

Capillary resistance tests by the positive pressure method gave positive results in all but 1 of 13 scorbutic infants, but following the administration of ascorbic acid negative tests resulted in only 2 cases. The opinion is expressed that, while petechiae can usually be produced in the scorbutic infant, "the administration of vitamin C in amounts sufficient to initiate clinical healing of scurvy will not always produce early disappearance of this phenomenon." A single case is given of an infant operated on for pyloric stenosis in whom the healing of the wound was apparently stimulated within 24 hr. by the intravenous administration of a single dose of ascorbic acid (300 mg).

Complete case histories are given of three infants during therapeutic treatment with crystalline vitamin C.

The normal value [of ascorbic acid] for man [trans. title], A. GIROUD, M. RABINOWICZ, and E. HARTMANN (*Bul. Soc. Chim. Biol., 20 (1938), No. 9–10, pp. 1097–1101, fig. 1*).—The extremely low figures for the ascorbic acid content of human tissues in the limited amount of information available from autopsy material and the large quantities of ascorbic acid commonly required to saturate the tissues, as determined by urinary excretion after test doses, are considered to indicate that human diets as a rule are deficient in vitamin C and that this may account for low resistance to infection.

The normal amount of ascorbic acid [trans. title], A. GIROUD, C. P. LEBLOND, R. RATSIMAMANGA, and E. GERO (*Bul. Soc. Chim. Biol., 20 (1938), No. 9–10, pp. 1079–1087, figs. 2*).—Determinations, usually by the Tillmans titration method, of the content of ascorbic acid in certain organs and tissues of various species capable of synthesizing the vitamin have shown a remarkable constancy in the concentration of the vitamin in any specific organ or tissue. This more or less constant quantity in decreasing order of adrenals, liver, kidney, and muscle tissue is considered to be in proportion to the essential functions of the particular organ or tissue. In species which are capable of synthesizing vitamin C it is suggested that the normal state of vitamin C nutrition is that in which the quantity of ascorbic acid found in any particular organ will be similar to that in the same organ of animals which synthesize vitamin C.

Realization of the normal value [of ascorbic acid] in the guinea pig [trans. title], A. GIROUD, C. P. LEBLOND, R. RATSIMAMANGA, and E. GERO (*Bul. Soc. Chim. Biol., 20 (1938), No. 9–10, pp. 1088–1096, figs. 4*).—Guinea pigs fed various doses of pure ascorbic acid or vegetables furnishing known quantities of the vitamin were sacrificed for determinations of the ascorbic acid content of the adrenals, liver, and kidneys. It was found that not until the daily

intake of ascorbic acid reached 50 mg. did the content of ascorbic acid in the organs tested reach that characteristic for the particular organ in the species examined in the study noted above. On plotting as abscissas the logarithms of various doses of vitamin C furnished and as ordinates the mean values obtained for the ascorbic acid content of the adrenals, a straight line curve resulted. As a final test of the guinea pig requirements for vitamin C, two groups of 7 and 5 animals each were fed for 20 and 18 days, respectively, ad libitum on a mixed diet rich in fresh vegetables and were then sacrificed for determinations of the vitamin C content of the various organs. In both cases the values obtained corresponded closely to those obtained in the first study. It is concluded that the guinea pig requires about 50 mg. of ascorbic acid daily to maintain the normal concentration of vitamin C in its organs and tissues.

The vitamin C status of college women as determined by urinary excretion, H. S. MITCHELL, O. A. MERRIAM, and E. L. BATCHELDER. (Mass. State Col. and R. I. Expt. Sta.). (*Jour. Home Econ., 30 (1938), No. 9, pp. 645–650, figs. 2*).—The subjects of this investigation were two groups of freshmen women students at Massachusetts State College and a group of freshmen and another of junior women students at Rhode Island State College. The two Massachusetts groups were tested soon after entering college and again in the following spring. For all subjects, totaling 210 freshmen and 40 juniors, ascorbic acid titrations by 2,6-dichlorophenolindophenol were made of 24-hr. samples of urine preserved with glacial acetic acid in glass jars protected from the light and kept in the refrigerator until tested, for the most part directly following the last collection.

On the students' ordinary diet, with no guidance as to food selection to secure an abundance of vitamin C, wide variations were shown in the first values obtained from the freshmen students, minimum, maximum, and average values for the three groups being, 3, 80, and 20 mg. per 24 hr., 8, 78, and 22, and 1, 73, and 15 mg. per 24 hr., respectively. Corresponding values obtained in the second period for the two Massachusetts groups and for the group of Rhode Island juniors were 7, 145, and 33 mg. per 24 hr., 3, 106, and 27, and , 158, and 28 mg. per 24 hr., respectively. The graphic array of individual data showed a striking similarity in the distribution of values in the various groups in the first period, there being a closer correspondence among the three groups than in the same groups when tested in the fall and spring. The higher values in group 2 are thought to reflect aroused interest in the selection of foods for their vitamin C content either through direct advice or increased knowledge of food selection.

Data are also reported on the urinary excretion of ascorbic acid by a few of the subjects after test doses of 300 or 400 mg. of crystalline ascorbic acid. In general the subjects with low preliminary excretion values and better food histories excreted a relatively larger proportion of the test dose than those whose preliminary excretion was low.

The behavior of ascorbic acid in pregnancy, at childbirth, during the puerperium, and in the first days of the life of the infant [trans. title], ELMBY and P. B. CHRISTENSEN (*Klin. Wchnschr., 17 (1938), No. 41, pp. 1432–1434, fig. 1*).—Data are reported on the ascorbic acid content of the blood of 200 women in the fifth and ninth months of pregnancy, at childbirth, and on the following fifth and tenth days, and of the cord blood, the breast milk at the fifth, tenth, and thirtieth days, and the ear blood of the newborn infants. The blood values were determined by the methylene blue method of Lund and Lieck or its micromodification by Elmby and With (E. S. R., 77, p. 742) and the values for

milk by either the Tillmans or the methylene blue method, the former giving values from 10 to 20 percent higher than the latter. The subjects were divided into three classes relative to the abundance of citrus fruits, potatoes, other vegetables, milk, and meat in their diet. The women in the third or highest class consumed as many as six oranges or lemons daily.

Although the absolute values reported are much lower than customarily given, owing to the method used, they show the same relative changes as have been reported in other studies. The serum ascorbic acid content of the blood of pregnant women was proportional to the abundance of vitamin C-rich foods in the diet. By the fifth month of pregnancy the values were slightly lower than corresponding values for nonpregnant controls and by the ninth month and at childbirth considerably lower, with no appreciable increase on the fifth or tenth day after childbirth. Cord blood was without exception considerably higher in ascorbic acid content than the corresponding blood of the mother and blood taken from the infant's ear somewhat lower than cord blood but higher than maternal blood. The ascorbic acid content of the breast milk was proportional to the richness of the mother's diet in vitamin C and showed very little variation in samples taken on the fifth, tenth, and thirtieth days. The lowest value reported for breast milk was 0.9 mg. and the highest 6.7 mg. per 100 cc. Enrichment of vitamin C-deficient diets with 100 mg. daily of ascorbic acid during the first 10 days after childbirth resulted in a marked increase in the ascorbic acid content of the milk. In the group on the most deficient diets, 26 out of 74 infants were prematurely born, in the middle group 6 out of 58, and in the group on the richest diets 3 out of 40 infants were prematurely born.

Vitamin C content of the blood in newborn infants, A. W. FLEMING and H. N. SANFORD (*Jour. Ped., 13 (1938), No. 3, pp. 314–321, figs. 2*).—This report includes data obtained by the Farmer and Abt micro- and macromethods.

In a control group of 51 miscellaneous dispensary patients from 6 to 60 yr. of age, minimum, maximum, and average values for ascorbic acid of the blood plasma were 0.4, 1.8, and 0.99 mg. per 100 cc., with 76 percent of the subjects giving values between 0.5 and 1.2 mg. per 100 cc. In 123 newborn infants the values ranged from 0.4 to 1.2 mg. and averaged 0.753 mg. per 100 cc., with 78 percent of the values lying between 0.5 and 0.9 mg. In the 105 mothers of these infants corresponding values of 0.5, 1.4, and 0.884 mg. per 100 cc. were obtained, with 72 percent of the values lying between 0.8 and 1.2 mg.

Other data presented showed that the concentration of ascorbic acid in the infant's blood is directly determined by its concentration in the mother's blood, but that this has no effect on the volume of breast milk, the infant's birth weight, or early gains or losses in weight. The birth weight of the infant is not related to the ascorbic acid content of its own blood, but a gain in weight of the infant receiving breast milk of good quality with respect to ascorbic acid is followed by a small gain in the vitamin C content of the infant's blood. The concentration of ascorbic acid in the post-partum blood of the mother was found to be proportional to her vitamin C intake during pregnancy, the values reported ranging from an average of 1.88 mg. for 9 women on a vitamin C intake equivalent to one orange a day to 0.546 mg. per 100 cc. for a group of 9 receiving less than one orange a week.

The content of reduced ascorbic acid in blood plasma in infants, especially at birth and in the first days of life, P. W. BRAESTRUP (*Jour. Nutr., 16 (1938), No. 4, pp. 363–373, fig. 1*).—The blood plasma of 22 women immediately after childbirth contained from 0.12 to 0.72, with an average of 0.26, mg. ascorbic acid per 100 cc. as determined by the Farmer-Abt micromethod. Corresponding values for cord blood were 0.36, 2.6, and 1.07 mg. per 100 cc.

and for the heel blood of the infants at birth 0.28, 1.28, and 0.69 mg. per 100 cc. and on the tenth day of life 0.12, 0.64, and 0.27 mg. per 100 cc., respectively. Relatively high values in the mother were accompanied by proportionately high values in her infant.

In 5 infants from 2 to 5 weeks of age fed boiled cow's milk, plasma ascorbic acid determinations were made before and at intervals of a few days up to 28 days after the administration of ascorbic acid in amounts of 20 (3 subjects) and 10 mg. (2 subjects) per day, respectively. The values before the administration of ascorbic acid were very low, ranging from 0.12 to 0.34 mg. per 100 cc. and were increased only slightly following the ingestion of 10 mg. ascorbic acid daily for 15 days, but showed a marked increase following the ingestion of 20 mg. ascorbic acid or 1 oz. of orange juice daily. This difference is considered of significance in view of the fact that 20 mg. daily represents the minimum amount of ascorbic acid an infant receives when fed exclusively on human milk.

"An average daily intake of 150 cc. milk per kilogram body weight allows a minimum of 3 mg. and in most cases a customary intake of 5 to 8 mg. per kilogram of ascorbic acid daily for the first few months. Until reliable methods for the determination of vitamin C subnutrition are available this must be considered to be the standard intake. In practice this means that all infants who are not given human milk must have an extra supply of vitamin C corresponding in the first few months to at least 20 mg. of ascorbic acid daily. As the vitamin C content of human milk varies so greatly with the diet, it is preferable to give extra vitamin C in winter and spring, even to infants fed on human milk."

The determination of reduced and total ascorbic acid in blood plasma [trans. title], F. Widenbauer and E. Schneider (*Klin. Wchnschr., 17 (1938), No. 48, pp. 1694, 1695*).—The authors have adopted the metaphosphoric acid precipitation of the protein in blood plasma according to the method of Farmer and Abt in connection with the methylene blue technic of Lund and Lieck (E. S. R., 79, p. 151), and describe the technic for the determination of total and reduced ascorbic acid in blood plasma.

On the basis of a comparison of the reduced ascorbic acid content of the blood plasma of adults, children, and infants with data obtained by saturation tests, the following standards are suggested for judging vitamin C status from blood values: 1 mg. or over per 100 cc., very good; about 0.5 mg., good or average; from 0.35 to 0.25 mg., extremely poor; and 0.2 mg. per 100 cc. or below very deficient. The highest value obtained, 4.5 mg. per 100 cc., was from a woman who had been taking a pure vitamin C preparation for several months and the lowest, 0, in very ill, artificially fed, or prescorbutic infants.

An effect of lipid feeding upon vitamin C excretion by the rat, R. R. Musulin, R. H. Tully, III, H. E. Longenecker, and C. G. King (*Science, 88 (1938), No. 2293, p. 552*).—In attempts to discover the biological precursor of vitamin C, the authors have devised a technic for collecting 24-hr. samples of urine from rats without the loss of any ascorbic acid which may be contained therein, and have demonstrated that rats fed on a stock diet of Purina chow or Sherman diet No. 13 show a sharp drop in ascorbic acid excretion when deprived of food, or a more gradual drop when placed on a diet of condensed milk. Consequently the test animals are deprived of food for 3 or 4 days and are then given condensed milk alone for from 3 to 6 days, after which the substance to be tested as a precursor of vitamin C is fed as a supplement to condensed milk.

Common purified foodstuffs such as sugars, proteins, and oils have been found not to affect the rate of excretion of vitamin C, but the feeding of oats, oat oil, the unsaponifiable matter from oat oil, and halibut-liver oil, is followed promptly by a high rate of excretion of vitamin C, the response with respect to time and extent being comparable to that obtained by feeding the pure vitamin. Certain volatile fractions from liver oil and oat oil are particularly active, but the fatty acids and common sterols are inactive. The results have been verified by biological assays with guinea pigs. The possibility is recognized that the lipid effect may be exerted through an indirect agency, but the weight of evidence at the present time is thought to favor the interpretation that the vitamin is formed by conversion from lipid to carbohydrate.

The incidence of hemolytic streptococci in the tonsils of children as related to the vitamin C content of tonsils and blood, A. D. Kaiser and B. Slavin (*Jour. Ped., 13 (1938), No. 3, pp. 322–333, figs. 5*).—A group of 123 children from 6 to 16 yr. of age, selected by school physicians for various reasons to have their tonsils and adenoids removed, served as subjects for this comparative study of the vitamin C content of the blood and the vitamin C content and presence of hemolytic streptococci in the tonsils immediately after removal.

The vitamin C content of the blood ranged from 0.5 to 1.08 mg. and of the tonsils from 18.6 to 53.7 mg. per 100 cc. The presence of hemolytic streptococci in the tonsils was demonstrated in about 50 percent of the children, and an inadequate vitamin C intake, as far as could be ascertained by incomplete records obtained from the mother on the customary intake of citrus fruits, tomato juice, and pineapple juice, in about 40 percent of the children. Approximately one-third of the children had low values of vitamin C in both blood and tonsils, but comparisons of the values for the same children showed no constant relation. In children whose tonsils contained hemolytic streptococci the vitamin C content of both blood and tonsils was significantly lower than children whose tonsils did not contain hemolytic streptococci. In tests on mice it was demonstrated that 40 percent of the streptococci found in the tonsils of the children with the lowest vitamin C values were virulent, as compared with 30 percent when the vitamin C values were average and only 10 percent when they were above average.

The evidence is thought to suggest that an adequate concentration of vitamin C in the blood influences the incidence of hemolytic streptococci in the tonsils, although it is also possible that it is the infection in the tonsils that causes a lowering of the vitamin C content. As the concentration of vitamin C in the blood is probably determined by the dietary intake and the metabolism of vitamin C varies with the individual, it is concluded that from the clinical point of view it is desirable to supply children with more than the minimum amount of vitamin C in their diets.

The vitamin C status of diabetic patients, V. Sebesta, R. M. Smith, A. T. Fernald, and A. Marble (*New England Jour. Med., 220 (1939), No. 2, pp. 56–60*).—The diabetic subjects studied, who were under observation at the clinic directed by E. P. Joslin, included 31 men and 46 women from 15 to 76 but chiefly over 50 yr. of age who were suffering from lesions of the extremities or convalescing from operations for them, but had no fever or obvious signs of infection. The diets of the patients prior to admission to the hospital were considered to be reasonably adequate in vitamin C, and the hospital diet was estimated to furnish from 80 to 140 mg. of the vitamin daily. Tabulated data reported for 49 of the subjects include the pertinent history, blood sugar, and ascorbic acid content of the fasting blood and ascorbic acid content of the

urine collected for 5 hr. following the intravenous injection of a 1,000-mg. dose of ascorbic acid.

In comparison with the standard suggested by Wright et al. (E. S. R., 79, p. 714) of an excretion of 400 mg. or more of the 1,000-mg. dose of ascorbic acid in the first 5 hr. and 0.8 mg. per 100 cc. as the lower limit for the ascorbic acid content of the fasting blood, only 6 of the 49 subjects showed definitely low values in both blood and urine and of these 4 were surgical cases. The fasting blood values usually bore a direct relation to the urine values, the exceptions being either borderline cases for blood or urine or surgical cases. Excluding the cases in which any surgical lesion might have been a complicating factor, only 9 patients gave any indication of a lowered vitamin C status. Of these, 2 had low values for both blood and urine, 3 low urine but normal blood, and 4 low blood but normal urine values. In 6 normal subjects used as controls the vitamin C content of the fasting blood ranged from 1.22 to 1.79 mg. per 100 cc. and the content in the 5-hr. urine from 495 to 886 mg.

The data are thought to indicate clearly that the average patient with uncomplicated diabetes is capable of a normal status as regards vitamin C if given adequate amounts of the vitamin in the diet. "With the increasing and laudable tendency to make diabetic diets more nearly like normal ones, this conclusion emphasizes anew the value of fruit, especially citrus fruit, and green vegetables, as included in the classic dietaries for patients with diabetes." The low values for blood and urine in surgical cases, including those who had been operated on and those who had unoperated lesions of the extremities, were considered by the authors as surprising in view of the fact that the patients had no definite signs of infection or that some time had elapsed since the operation. It would seem to indicate that both the infection and ensuing operation had caused an excess drain on the vitamin C reserves.

Vitamin C in tuberculosis.—The effect of supplementary synthetic vitamin C on the urinary output of this vitamin by tuberculous children, T. S. Bumbalo and W. W. Jetter (*Jour. Ped., 13 (1938), No. 3, pp. 334–340, figs. 2*).—Following a period to determine the basic vitamin C elimination level, 50 mg. of synthetic ascorbic acid in tablet form was administered daily to 10 tuberculous children until normal excretory levels were established and maintained. One of the subjects was also observed daily after discontinuance of the vitamin and the others tested 2 weeks after discontinuance. As controls 6 normal healthy children with an average vitamin C intake comparable to the tuberculous group were studied for their normal excretion of vitamin C and were then given the same ascorbic acid supplement until the maximum increase in excretion was obtained, after which the supplement was discontinued and the urine again examined. Of the 10 tuberculous children all had pulmonary involvement, 8 were bed patients, and the nutrition was considered poor in 2 cases and fair in 8.

In the tuberculous group the average 24-hr. urinary excretion of ascorbic acid was 6.4 mg. over a period of 4 days. It required a total of 750 mg. of ascorbic acid over a period of 15 days to raise the daily excretion to slightly over 10 mg. and a total of 1,050 mg. in 21 days to raise it to 15 mg. The maximum daily excretion was 23 mg., reached in 24 days after a total intake of 1,200 mg. of ascorbic acid. After discontinuance of the vitamin supplement the values fell to the original low levels by the sixth day. Of the 10 subjects, in only the one who showed clinically the least involvement of any was there any considerable variation from the average, a total of only 600 mg. over a period of 12 days being sufficient to increase the excretion of ascorbic acid to 24 mg. In the healthy controls the average daily excretion of ascorbic acid during a

5-day preliminary period was from 30 to 35 mg., and on supplementary feedings of synthetic ascorbic acid the excretion rose sharply to an average of 70 mg. on the second day after a total intake of 100 mg. A maximum value of 77.5 mg. was noted on the fourth day. On discontinuance of the supplementary vitamin the excretion fell rapidly, reaching the previous level of from 30 to 35 mg. on the third day.

These results are thought to indicate a definite hypovitaminosis C in active tuberculosis and to suggest increased vitamin C intake as a therapeutic measure.

Vitamin C and resistance of the guinea pig to infection with Bacterium necrophorum, N. B. McCullough (*Jour. Infect. Diseases, 63 (1938), No. 1, pp. 34–53, figs. 9*).—The extensive and somewhat controversial literature on the relation of vitamin C deficiency to various pathological conditions and infections in experimental animals and human subjects is reviewed, with numerous footnote references, and studies are reported on the relation of vitamin C deficiency in guinea pigs to infection with human and animal strains of *B. necrophorum.*

Avirulent human strains did not produce infection in the animals receiving adequate vitamin C or in those with subacute scurvy, but produced minor abscesses in the extremely scorbutic animals. Vitamin C therapy resulted in prompt recovery of the infected animals. With the slightly more virulent animal strains infections were produced in both controls and vitamin C-deficient animals, but were much more severe in the latter and the animals died sooner than the controls.

The results are thought to afford good proof that vitamin C deficiency decreases resistance to infection, although a rather severe scorbutic condition is necessary before the weakened resistance is evident.

Infantile scurvy, G. L. Carr (*Med. Woman's Jour., 46 (1939), No. 3, pp. 75–81, figs. 6*).—The discovery by roentgen examination of six cases of florid infantile scurvy and two cases of the subclinical type in a 250-bed hospital for indigent and near-indigent patients within a period of 3½ yr. is considered of significance in "these days of scientific feeding." One reason for the increase of incidence of the disease is thought to be the inability of the present medical student or intern to recognize the symptoms of a disease which has been so seldom seen in recent years.

Methods of determining vitamin C deficiency by capillary resistance tests and analyses of urine and blood plasma are reviewed briefly and the roentgen ray examination of the bones in considerable detail, particularly the rather difficult diagnosis in the earlier stages of scurvy and in the presence of incompletely developed rickets. Two case reports are given. One is for a 9-month-old infant who had gradually become depleted of vitamin C through inadequate supplements, but was cured by intramuscular injections of ascorbic acid, followed by massive oral doses of ascorbic acid and orange juice. The other case illustrates the development of scurvy in a premature infant while a hospital patient, with failure to identify the condition until examination on autopsy.

Vitamin D in diet: Palatable methods of supply, J. Lindsay and V. H. Mottram (*Brit. Med. Jour., No. 4070 (1939), pp. 14, 15*).—On the principle that the fishy flavor of cod-liver oil will not be detected in fish dishes, recipes are given in which cod-liver oil is an ingredient. These include a white sauce to serve with boiled, steamed, or baked fish, 1 tablespoonful of which sauce will furnish from 40 to 200 International Units of vitamin D, according to the potency of the oil; a mayonnaise, 1 tablespoonful of which will contain from 1,700 to 8,500 I. U.; a fish soup furnishing from 375 to 1,500 I. U. per half pint; and a cod-liver oil-containing batter for the deep frying of fish or fish roe.

Degeneration of cross striated musculature in vitamin E-low rats, H. M. Evans, G. A. Emerson, and I. R. Telford. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 625–627, figs. 2*).—The authors report that six rats reared and maintained on the vitamin E-low diet 427 developed a disability in locomotion accompanied by atrophy of the musculature of the flank and posterior limbs. Histological examination revealed degeneration of the muscle fibers.

Endemic fluorosis and its relation to dental caries, H. T. Dean (*Pub. Health Rpts. [U. S.], 53 (1938), No. 33, pp. 1443–1452, pl. 1*).—Dental examinations of 122 children residing in areas where the domestic water supplies contain from 1.7 to 3.5 p. p. m. of fluorine showed that 22 percent were free from dental caries as compared to 4 percent of a group of 114 children who had continuously used domestic water containing from 0.6 to 1.5 p. p. m. of fluorine. Analysis of data on the number of dental caries of over 8,000 children living in mottled enamel areas in a number of States revealed that the dental caries attack rate is inversely proportional to the presence of mottled enamel.

The antirachitic effect of some foods, E. F. Kohman, W. H. Eddy, M. E. White, and N. H. Sanborn (*Food Res., 3 (1938), No. 4, pp. 373–381*).—In this study, which was noted previously from a preliminary report (E. S. R., 72, p. 888), the results of additional experiments are presented to show that the substitution in the Steenbock and Black diet 2965 of 50 percent of several mixtures of canned foods such as chicken, roast beef, asparagus, peas, and spinach produced maximum calcification of the femurs in rats. The addition of cod-liver oil did not alter the calcifying action when the diets contained 50-percent substitutions of natural foods, but in the presence of 25- or 30-percent substitutions the calcification was increased slightly by the oil.

Failure of nicotinic and yeast nucleic acids in "filtrate factor" deficiency in rats, G. A. Emerson and H. M. Evans. (Univ. Calif.) (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 195–197*).—Twenty-four female rats were maintained on the Halliday and Evans diet 805 (E. S. R., 78, p. 284), supplemented by 10 μg. of thiamin chloride 6 times a week. After 4 weeks the rats were given in addition 40 μg. of riboflavin and molasses eluate equivalent to 4 gm. of molasses and other supplements as follows: Group 1, no supplement; group 2, 5 mg. of nicotinic acid; group 3, 5 mg. of yeast nucleic acid; and group 4, 5 mg. of yeast nucleic acid plus 5 mg. of nicotinic acid.

All the animals showed similar growth responses during the first 15 days, and the addition of 5 gm. of liver in the form of liver filtrate adsorbed on fuller's earth to remove the vitamin B_1, riboflavin, and vitamin B_6 to 3 of the negative control rats in group 1 resulted in an average daily gain of 2 gm. for the remainder of the 56-day period as compared to 0.48 gm. for the negative controls in group 1, 0.46 for group 2, 0.45 for group 3, and 0.36 gm. for group 4. All rats except those receiving the liver filtrate developed a type of skin lesion dissimilar to the florid acrodynia type of dermatitis characteristic of vitamin B_6 deficiency and had dull and lusterless fur.

TEXTILES AND CLOTHING

Co-operative project in textiles conducted by [six] northeastern experiment stations, A. B. Searle, E. N. Chapman, and E. D. Roseberry. (Pa. State Col.). (*Jour. Home Econ., 31 (1939), No. 3, pp. 177–184*).—This is a preliminary report on the performance during wear of women's and children's wearing apparel fabrics, employing chemical, microscopic, and durability tests. The purposes of the study are to find the type of information of most value to

the retail purchaser of textile fabrics, to set tolerances for the grading of fabrics from the consumer point of view, and to provide a basis for planning units of work on the purchasing of fabrics for classes in textiles.

Of the 570 fabrics that have been analyzed since the study was begun in 1936, 227 were cotton, 188 rayon, 66 silk, 48 wool, 17 mixtures of wool and rayon, 6 of cotton and rayon, and 4 of wool and cotton, and 14 were miscellaneous fabrics. The data indicate that the present test for yarn and seam slippage is not rigorous enough to predict accurately wearing performance, and that the test for launderability of colored cotton fabrics does not give a satisfactory index to the colorfastness for more than one or two launderings.

Durability of wearing apparel fabrics, P. B. Mack and A. B. Searle. (Coop. 6 expt. stats.). (*Pennsylvania Sta. Bul. 367* (*1938*), *p. 46*).—A progress report is given on the cooperative project noted above.

[Studies in textiles and clothing by the Iowa Station] (*Iowa Sta. Rpt. 1938, pt. 1, p. 163*).—Progress reports (E. S. R., 79, p. 572) are given on studies by R. Edgar of the protection from degradation which certain finishes provide wool and the comparative degradation of cotton cellulose and regenerated cellulose rayon by five oxidizing bleaches.

The usage of household textiles by farm families, M. E. Frayser (*South Carolina Sta. Rpt. 1938, p. 32*).—This progress report of a survey of quantities, kinds, and cost of textile materials used for household purposes by white and Negro farm families in the State contains tabulated data on sheets, pillows, and pillowcases.

Physical characteristics in cotton and their interrelationship, M. A. Grimes (*Texas Sta. Rpt. 1937, pp. 143, 144*).—In this progress report (E. S. R., 79, p. 717) on the study of two varieties of cotton, the polarizing microscope method is being used for maturity tests and the Chandler method for strength tests. The fineness of the fibers is being determined from cross sections made with the Hardy device, the area of the projected section being measured with a planimeter.

"Nylon" and its identification, W. von Bergen (*Rayon Textile Mo., 20* (*1939*), *No. 1, pp. 53–57, figs. 3*).—The author describes the basic principle of the process for the production of the new fiber known as Nylon, which is an entirely synthetic material from fiber-forming polymeric amides having a protein-like chemical structure and derivable from coal, air, and water, or other substances. From various physical and chemical tests the chief advantages of Nylon are reported to be high breaking strength, an elongation of 22–26 percent in both the dry and wet states, high elastic properties, and lack of sensitivity toward water and various chemical agents. The individual filaments can be produced far finer than any other artificial fiber except glass fibers. The fiber has a good affinity toward silk and wool dyestuffs and some of the direct dyes used for cotton and rayon.

For quick identification of pure Nylon fibers, the burning test in an open flame is recommended as the simplest and most reliable. Instead of burning, Nylon fibers melt and fuse to a glassy globule, changing from light brown and transparent to black and tarlike, depending upon the length of the test. The odor given off during burning is similar to that of boiling string beans and entirely different from that of any other animal or vegetable fiber.

HOME MANAGEMENT AND EQUIPMENT

Home management with special reference to the college home management house, I. H. Gross and M. E. Lewis (*New York: F. S. Crofts & Co.,*

1938, pp. XI+162, figs. [7]).—Both the technological and the human values are emphasized in this textbook dealing with the problems related to the management of time, energy, money, and material resources. One chapter is devoted to the elements that enter into successful guidance of the work of others. The problems of human relations in a resident course in home management are discussed in a chapter on human values. A rating sheet for students in home management houses, suggestions for menu planning, and aids in meal planning are contained in an appendix.

[Home management studies by the Wisconsin Station] (*Wisconsin Sta. Bul. 442 (1938), pp. 35, 36*).—This progress report (E. S. R., 78, p. 898) consists of summaries of studies by M. L. Cowles and H. G. Ahlgren on the habits and preferences of Madison homemakers in the purchase and consumption of canned peas and by Cowles and G. Voigt on the comparative cost of home construction and purchase of women's and children's clothing.

Farm family living on a group of North Dakota farms, D. G. Hay and S. Best (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 3, pp. 13–16, fig. 1*).—This report covers the analysis of farm family account books kept for nearly a year in 1937 by 81 families in 24 counties of the State through the cooperation of the U. S. D. A. Farm Security Administration, of which the families were loan clients. The farms, which averaged 305 acres in size, were fully owned by 11 of the farm operators, partly owned by 16, and rented by 54. The average size of the family was 5.4 persons.

For the 75 families reporting total cash receipts, the lowest, highest, and average cash incomes from all sources were $319, $2,010, and $990. The chief sources of these incomes, with the average for each source, were sale of crops $161, poultry and dairy products $161, and livestock $126. Of the total average cash receipts, $457 came from the farm and $533 from Farm Security loans, supplementary grants, and other income.

From the records of 51 families who kept accounts of the farm products used by the family, the average cash value of family living furnished by the farm was calculated to be $276. The average values of the farm products produced and consumed at home were $72 and $58 per adult male equivalent, using the Zimmerman standard (E. S. R., 62, p. 389), for the owner and tenant families, respectively. The difference in these values, which was chiefly in dairy products and meats, is thought to be due largely to the comparative insecurity of tenure of farm renters.

For the entire number of farm families the average cash expenditure for family living was $369 per family, the owners averaging $84 and the tenants $92 per adult male equivalent. The proportional distribution of expenditures among the different items of family living was food 41 percent, clothing 15, household operation 9, housing and furnishing 5, medical care 5, education and recreation 4, gifts, church, and welfare 3, personal 2, payments on notes 5, and unclassified 11 percent.

MISCELLANEOUS

Statistical technique in agricultural research: A simple exposition of practice and procedure in biometry, D. D. Patterson (*New York and London: McGraw-Hill Book Co., 1939, pp. [X]+263, figs. [18]*).—A presentation of the plans of statistical analysis, with special reference to agricultural experimentation.

A handbook of statistics for use in plant breeding and agricultural problems, F. J. F. Shaw (*Delhi: Imp. Council Agr. Res., India, 1936, pp. [5]+182, figs. 20*).—A presentation of the elements of statistics of special application to the analysis of genetic and agricultural problems.

Forty-eighth Annual Report [of Alabama Station], 1937, M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1937, pp. 34, figs. 2*).—The experimental work reported is for the most part referred to elsewhere in this issue.

Sixty-first Report of the Connecticut Agricultural Experiment Station, New Haven, for the year 1937, W. L. SLATE ET AL. (*Connecticut [New Haven] Sta. Rpt. 1937, pp. [906], figs. 134*).—In addition to the usual administrative data, this report contains reprints of Bulletins 404–416, all of which have been noted previously, and the following circulars: Nos. 119, A New, Early, Productive Summer Squash, by L. C. Curtis (pp. 1–7); 120, Requirements for Tree Workers in Connecticut (pp. 9–24); 121, Vegetable Pest Control Schedule, by N. Turner and A. A. Dunlap (pp. 25–49); 122, The "X Disease" of Peach, by E. M. Stoddard (pp. 53–60); 123, The Use of Water Soluble Preservatives in Preventing Decay in Fence Posts and Similar Materials, by H. W. Hicock (pp. 61–68); 124, Law and Regulations Concerning the Inspection and Shipment of Nursery Stock in Connecticut, by W. E. Britton (pp. 69–75); and 125, Regulations Concerning Transportation of Nursery Stock in the United States and Canada, compiled by W. E. Britton (pp. 77–105).

Report on agricultural research [of Iowa Station] for the year ending June 30, 1938, I, II, R. E. BUCHANAN ET AL. (*Iowa Sta. Rpt. 1938, pts. 1, pp. 262, figs. 17; 2, pp. 80, figs. 4*).—Part 1 of this report includes reports on all active projects except those relating to work coordinated under the Iowa Corn Research Institute, which is included in part 2. The experimental work not previously noted is for the most part referred to elsewhere in this issue.

Report of progress [of Maine Station] for year ending June 30, 1938, [F. GRIFFEE ET AL.] (*Maine Sta. Bul. 391 (1938), pp. 233–332, figs. 6*).—This contains data noted for the most part elsewhere in this issue or previously.

Fifty-first Annual Report [of Cornell Station], 1938, C. E. LADD ET AL. (*[New York] Cornell Sta. Rpt. 1938, pp. 72–169*).—The experimental work reported is for the most part noted elsewhere in this issue.

Science serving agriculture: [Biennial Report of Oklahoma Station, 1937–38], L. S. ELLIS (*Oklahoma Sta. [Bien.] Rpt. 1937–38, pp. XV+231, figs. 41*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Special agricultural investigations, compiled by R. S. BESSE and J. C. BURTNER (*Oregon Sta. Circ. 130 (1938), pp. [2]+50, figs. 121*).—A preliminary report of research authorized by the Oregon Legislature, 1937 Session, the findings for the most part being abstracted elsewhere in this issue.

Fifty-first Annual Report of the Pennsylvania Agricultural Experiment Station, [1938], R. L. WATTS ET AL. (*Pennsylvania Sta. Bul. 367 (1938), pp. [4]+68, figs. 14*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-first Annual Report of the South Carolina Experiment Station, [1938], H. P. COOPER ET AL. (*South Carolina Sta. Rpt. 1938, pp. 199, figs. 40*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fiftieth Annual Report [of Texas Station], 1937, A. B. CONNER ET AL. (*Texas Sta. Rpt. 1937, pp. 321*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

What's new in farm science: Annual report of the director, [Wisconsin Station, 1938], I, compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul. 442 (1938), pp. 113, figs. 20*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Arkansas University and Station.—The College of Agriculture has been given 100 acres of delta land near Clarkedale. This tract will be operated as a substation of the Cotton Branch Station and will be devoted to the breeding of cotton and corn and experimental work with insect control, legumes, and small grains on the delta soil. The construction of the necessary buildings is under way.

The retirement from public service is announced of Dean and Director Dan T. Gray, who is resigning as of July 1. As a recent statement announces, "under Dean Gray's administration and guidance the work of the College of Agriculture has grown in its effectiveness and service to the State. When he became dean and director in 1924, only two-thirds of the counties had the services of county agents and slightly over half had the leadership of home demonstration agents. Today all counties have county agents and home demonstration agents, and in addition 24 assistant agents are employed in the larger counties. Through his efforts a branch experiment station system was established in 1926 for the purpose of extending the college's research program in order that work might be done in areas of production in the State. There are now four branch experiment stations—the Cotton Branch Station in Lee County, Rice Branch Station in Arkansas County, Fruit and Truck Branch Station in Hempstead County, and the Livestock and Forestry Branch Station in Independence County—involving 3,700 acres of land devoted to agricultural investigations in the interest of the State's farm people. As the result of his progressiveness, student enrollment in the college has nearly trebled, and the College of Agriculture now ranks second among the colleges of the university in the number of students enrolled. . . .

"Among other contributions he has made to Arkansas agriculture are the development of an outstanding staff of workers; formation of a land-use program for the State; development of an educational program for older rural boys and girls; establishment of a program for outlying experimental work conducted in cooperation with farmers on their farms; development of a live-at-home program; establishment of study days and visiting days for 4-H Club members, vocational agriculture students, and adult farm people at the main and branch experiment stations; and the development of a broad research program with enlarged physical facilities such as buildings, land, and equipment."

Jack D. Paul, technical assistant, and H. W. Bitting, cooperative research supervisor, at the Rice Branch Station have resigned. The former has been succeeded by Travis C. Keahey.

California University and Station.—Three new buildings have been provided for the Davis campus. One of these is a new laboratory building for enology, which has been completed at a cost of slightly over $100,000. The building is composed of three main divisions, more or less self-contained. The utility section, which is 86 by 45 ft., with a basement, houses three air-conditioned fermentation and finishing rooms, refrigerated cellars or aging rooms, two cold-storage rooms, two high temperature rooms for aging and conditioning certain types of wines and brandies, distillation apparatus, an office, and a yeast laboratory. The

office and research wing, 34 by 50 ft., houses two laboratories, a wine library, and three offices. The instruction unit is 30 by 31 ft., with a basement, and includes a student laboratory equipped for sections of 18 students, an air-conditioned fermentation room, and two refrigerated aging rooms.

As an aid in commercial as well as experimental plant cultures under glass, an air-conditioned greenhouse unit has been completed as a cooperative project between the divisions of agricultural engineering and truck crops at Davis, the department of electrical engineering at Berkeley, and the California Committee on the Relation of Electricity to Agriculture. The latter committee has made a grant of $2,500 during a 2-year period to further the project. Half of a 100- by 30-ft. house has been rebuilt and equipped, the other half operating as a check. Installation of equipment and controls has been completed, and plantings are being made. Although under normal interior valley conditions greenhouses can be used but 5 months of the year, this house is designed for all-year use and will permit a varied range in humidities and temperatures. Plans for studies on variation in light quality and intensity are also contemplated as a part of a comprehensive study of environmental factors affecting plant growth.

A new library and administration building is expected to be ready for use by the opening of the second semester in January 1940. This is a two-story building, 300 ft. long. One wing will house administration offices, and the first floor of the middle section will provide classroom and office space, a map and herdbook room, a browsing room for student use, and library staff and work rooms. The main reading room, 144 by 48 ft., will occupy the entire middle section of the second floor. Provision for 90,000 volumes is being made. The building is a joint P. W. A.-university project, costing $325,000.

Dr. E. C. Van Dyke, professor of entomology, retired July 1 after 26 years of service to become professor of entomology emeritus. His work in entomological history and taxonomy will be carried on by E. O. Essig, whose duties in agricultural entomology will be undertaken by Dr. Guy F. MacLeod, professor of economic entomology at Cornell University. Drs. E. Gordon Linsley and Robert L. Usinger have been added to the staff as instructors in entomology, the former to be stationed at Berkeley and the latter at Davis.

Connecticut State Station.—Dr. Roger B. Friend, associate entomologist, has been appointed State entomologist and head of the department of entomology. Dr. Donald F. Jones, chief geneticist, has been elected a member of the National Academy of Sciences.

Purdue University.—Dr. Eldyn Everett Van Lone, assistant professor of animal husbandry since 1932, died April 5 at the age of 44 years. A native of Wisconsin, he received from the University of Wisconsin the B. S. degree in 1923, the M. S. degree in 1924, and the Ph. D. degree in 1931. While primarily a teacher of genetics, he had found time to conduct a considerable amount of experimental work on inheritance of hair pattern and color, characters that control sterility, and the colors of fat. He was an active collaborator on a project to study the physical, chemical, and histological changes of meat during quick freezing and storage at low temperatures. His genetics library, consisting of 93 bound volumes and a collection of periodicals, has been donated to the department of animal husbandry.

Louisiana Station.—Working along the lines indicated editorially last November (E. S. R., 79, p. 433), two new varieties of strawberries have been developed. By crossing Blakemore and Klondike, resistance to leaf spot and a higher percentage of sugar have been obtained, as well as increased earliness. Improvements have also been effected in the yield of sweet corn, length of cotton staple, and wilt resistance, and in other directions.

R. H. Lush, in charge of dairy research, has resigned to accept a position with the National Fertilizer Association. His headquarters will be in Washington, D. C.

Maine University and Station.—The university has recently purchased a farm for the use of the station at Presque Isle. The new purchase abuts Aroostook Farm and contains approximately 100 acres, of which about half is under plow. The remainder is in woods and when cleared will be for the most part suitable for potato production. The farm land, which becomes available to the station on November 1, will be used for plat work in studies with potatoes and other crops of Aroostook County.

Montana Station.—L. A. Clark has been appointed assistant agronomist in cooperation with the U. S. D. A. Bureau of Plant Industry.

Nebraska Station.—Two pieces of special equipment have been purchased recently. One of these is a photelometer for work in human nutrition and the other a sprayer which will develop considerable pressure and seems to be necessary in the control of potato psyllids.

Oregon Station.—A budget increase of $157,500 for special agricultural research projects during the coming biennium was further enlarged by the legislature to $172,400.

Pennsylvania College and Station.—Two new buildings constructed under the Federal P. W. A. program are nearing completion. One of these is the agricultural engineering building, a three-story structure of brick and limestone, which was dedicated May 10. The other is the new Frear Chemical Laboratory, also a three-story building, which is to be occupied early in the summer by the department of agricultural and biological chemistry.

Utah College and Station.—Dr. Leonard H. Pollard, associate in truck crops in the University of California, has been appointed head of the department of vegetable crops. Dr. A. E. Brandt, senior mathematical statistical analyst of the U. S. D. A. Soil Conservation Service, will serve as special guest professor of mathematics in the summer school, teaching courses in statistics and in the design of experiments.

International Congresses.—The Seventh International Congress of Genetics will be held in Edinburgh August 23–30, 1939. Sections are contemplated on gene and chromosome theory, cytology, physiological genetics, animal breeding in the light of genetics, plant breeding in the light of genetics, human genetics, and genetics in relation to evolution and systematics. Particular prominence is to be given to the application of genetics in the breeding of livestock and plants. Smaller groups may also be organized. Prof. F. A. E. Crew, director of the Institute of Animal Genetics, University of Edinburgh, is general secretary.

The Third International Congress of Agricultural Engineering will be held in Roma from September 20 to 23, 1939, at the International Institute of Agriculture. The program of the Congress has been drawn up by the International Commission on Agricultural Engineering. Irrigation, drainage, and land reclamation works, provisions for hygiene and buildings in rural areas, production of motive power by means of new combustible materials, standardization of tests of agricultural machinery, applications of electricity in agriculture, agricultural engineering and its social implications, and scientific management in agriculture are the main subjects in the agenda. Additional information may be obtained from the Secretariat, Via Regina Elena, 86, Roma, Italy.

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EXPERIMENT STATION RECORD

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THE ORGANIZATION OF AGRICULTURAL RESEARCH IN GREAT BRITAIN

These are days when questions of organization and reorganization are receiving much attention. Research is among the phases which are under scrutiny. In the United States a comprehensive study is under way by the National Resources Committee, and its report on Federal relations was recently discussed in these columns (E. S. R., 80, p. 577). In England a somewhat similar inquiry has been going on under what may be termed semiofficial auspices.

The findings in the British survey have been published in monograph form under the title of Report on Agricultural Research in Great Britain: A Survey of Its Scope, Administrative Structure and Finance, and of the Methods of Making Its Results Known to Farmers, With Proposals for Future Development. This report embodies the results of a survey of over 3 years' duration which was conducted by the research group of P E P (Political and Economic Planning). P E P is described as "an independent nonparty group, consisting of more than a hundred working members who are by vocation industrialists, distributors, officers of central and local government, scientists, doctors, university teachers, and so forth and who give part of their spare time to the use of their special training in fact finding and in suggesting principles and possible advances over a wide range of social and economic activities." Its research division, whose identity is not further revealed in the report, has been making a survey of the use of organized science in the United Kingdom, and agricultural research was selected as the first phase of its study.

In Great Britain agricultural research is controlled by a complex group of central governmental officials. In general, grants of public funds are made by the Development Commission with the advice of the Agricultural Research Council and administered by the Ministry of Agriculture in England and Wales and the Department of Agriculture for Scotland. The bulk of the actual research is carried on by specialized research institutes, although both the Ministry of Agriculture and the A. R. C. conduct some research directly. Then there are 17 provincial advisory centers, where advisory officers in 6 of the agricultural sciences are stationed. The final link with the farmer is provided by advisory services under an agricultural organizer in each county.

About 50 institutions carry on research. Some of these are primarily educational in purpose with research as a byproduct, but in about 28 research is the paramount consideration. These include three types—government laboratories or research stations, institutions attached to universities or colleges, and institutes such as Rothamsted and the John Innes Horticultural Institution. All of these are to a greater or lesser degree dependent on grants from the Development Fund and its replenishment and supplementing by Parliament from time to time. There are also two imperial institutes and nine imperial bureaus which are financed collectively by the Governments of the British Empire, and provide an information and abstracting service in the subjects of entomology, mycology, soil science, animal health, nutrition and genetics, plant genetics, fruit production, agricultural parasitology, and dairying. These bureaus are located at the research institutes and are under the same director. In addition to this public support, perhaps 10 percent of the total research is carried on without any state subsidy at universities, agricultural colleges, and farm institutes, and by private firms, societies, and individuals.

The total annual expenditure from public funds for agricultural research in Great Britain is estimated as at least £700,000. This is considerably less than 1 percent of the total output of the land, and is regarded as inadequate. It is suggested, however, that in a program of enlargement, "though it is only right that the lion's share of the expense should be borne by the state, the wide range of interests on which agricultural research confers material benefits should also contribute, and to a greater extent than they do at present." The principal additional sources of revenue which are considered are (1) the products of research, (2) the farming community, and (3) processors, distributors, etc. It is thought that "more might be made out of the sale of the research institutes' own wares in the shape of royalties on new breeds and processes, fees for tests and educational training, and ordinary farming profits." Then, too, it is claimed, "farmers themselves contribute strikingly little toward the cost of research which is primarily for their benefit, yet a large sum could be raised by a comparatively small levy or contribution per acre." Therefore, "the possibilities of levies on products as means of raising funds for agricultural research might be further explored. . . . Where imports of agricultural produce are controlled, the joint interests of consumer and producer might be served by imposing a small levy and earmarking the proceeds partly or wholly for agricultural research. In other parts of the Empire, notably India, Ceylon, and Malaya, levies on exports have successfully been used to finance research, for example on rubber and tea."

Mention is also made of another class of beneficiaries from the results of agricultural research, who are "by no means pulling their weight and who might well be asked to contribute more toward its cost." These "are the processors and distributors of agricultural produce and the manufacturers of agricultural equipment. The processors and distributors include sugar refiners, butchers, millers, bakers, brewers, maltsters, and dairymen. Of these only the sugar refiners have made any organized large-scale provision for research, though the millers and certain large dairy firms have made minor grants. The dairy firms also maintain extensive laboratories of their own. The manufacturers of agricultural equipment, especially fertilizers, feeding stuffs, insecticides, veterinary preparations, and agricultural machinery, also owe much to the discoveries of research workers and might well consider repaying some of their debt. All these industries might well consider making, in addition to ad hoc grants toward pieces of research likely to result in immediate material benefit, regular contributions which might be earmarked to particular branches of research, but would be a token of the general benefits gained by the industry from research."

The report makes it plain that the problem of finance is closely bound up with that of personnel. It criticizes the prevailing scale of salaries as too low, especially in veterinary work, where the able younger man who "undertakes work of national importance in combating diseases of livestock or poultry is unduly heavily penalized for not going into private practice and attending to the ailments of lap dogs. . . . It is no economy to cut salaries below the level at which men of sufficient caliber can be attracted and kept in the service without feelings of frustration. Agricultural research needs men with initiative and resource, with high mental capacity, and with the imagination to grasp the practical needs of a varied industry which has not learned to think in scientific terms or to formulate its own requirements. The number of such men at present in the ranks is too small; it is creditable in the circumstances that there should be as many as there are. Some of the men who ought to supply vigor and leadership either refuse to enter a profession with such poor prospects or, having entered it, succumb to a justifiable dissatisfaction which eventually leads them to accept commercial offers or to sink into a rut."

Inevitably, considerable discussion is given of the problem of coordination of research. This function is entrusted chiefly to the Agricultural Research Council, organized for the purpose in 1931 and described subsequently in these columns (E. S. R., 72, p. 578). The work of this body is commended, but it is stated that its activities are seriously handicapped by a shortage of personnel. As a means

of relieving the situation, the report suggests the appointment of special directors for the various branches of industry. These specialists would spend at least 3 months of the year visiting the research institutes and also make some visits to noted foreign research stations to compare methods used abroad. Among other duties they would keep complete "records of the problems requiring investigation and the work in progress [and] deal with the interchange of problems and information between the institutes to avoid overlapping and insure that field workers hear of the results of laboratory work as soon as they are available."

The final recommendation of the report takes up the utilization of research. Marked defects are indicated in the present system in the dissemination of findings, notably the absence of any provision for centralized coordination and direction. The establishment of a central body is advocated to act as a public relations and extension service. This service would coordinate research and extension and "might take over the responsibility for all official journals and other publications concerned with the agricultural sciences." The value of a separate body or department devoted wholly to this work would be that "the public relations of agricultural research would no longer be dependent on the time that busy scientists and administrators could spare from their proper jobs, and the extension services could be planned by men skilled in the art of putting results across. The volume of knowledge put forth by twentieth-century civilization is so vast and ramifying that without the oil of public relations work the complicated machinery of national and international relations is bound to get clogged. In agricultural research, as in other economic activities, a public relations policy is no longer an American novelty but a British necessity, while without an efficient extension service the whole research structure is stultified."

This report was obviously prepared to meet a specific situation and locality, and even its compilers probably had little thought of its application to other conditions. Nevertheless many principles of fundamental importance have been dealt with constructively. Its findings and their interpretation should be of interest to research administrators and workers in general.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[**Chemical investigations by the California Station**] (*California Sta. [Bien.] Rpt. 1937–38, pp. 101, 102, 104–110*).—These have dealt with sulfuring difficulties with dried fruits; dried prunes, figs, and raisins; color in grapes and wine; wine types in California; fermentation of wines; use of Spanish sherry yeasts; oxidation of sherry wine; fruit and vegetable juices; other uses for surplus fruits and nuts; olive products; and plant pigments in fruits and vegetables.

[**Chemical investigations by the Delaware Station**] (*Delaware Sta. Bul. 214 (1938), pp. 19, 20*).—The extraction of phospholipids from soybean oil meal has been studied by A. A. Horvath, and factors affecting the viscosity or plasticity of pectin and pectin-sugar solutions as an index to jell formation by G. L. Baker and M. W. Goodwin.

[**Chemical investigations of the Florida Station**] (*Florida Sta. Rpt. 1938, pp. 76, 77, 98–100*).—These are reported upon as follows: An improved colorimetric method for iron, by H. W. Winsor, and the preservation of orange juices and pulps, by A. L. Stahl.

[**Chemical and bacteriological investigations by the New York State Station**] (*New York State Sta. Rpt. 1938, pp. 12, 14, 15, 17*).—Work briefly noted has been concerned with the canning of apple and grape juice, prevention of lead contamination of maple sirup, influence of salts on the properties of gelatin, and aldehyde condensation products of amino acids and proteins.

[**Chemical investigations by the Washington Station**]. (Coop. U. S. D. A.). (*Washington Sta. Bul. 368 (1938), pp. 27, 28, 94–96*).—Fruit byproducts are reported upon by A. M. Neubert, H. H. Mottern, and J. L. St. John; apple products utilization, by Mottern, Neubert, and P. D. Isham; and soft fruit products utilization and vegetable products investigations, both by Neubert and Mottern.

Bacterial metabolism, M. STEPHENSON (*London and New York: Longmans, Green and Co., [1939], 2. ed., pp. XIV+391, figs. [46]*).—Originally published (E. S. R., 62, p. 707) as one of the Monographs on Biochemistry, this work is now felt to be unsuited to monograph form, "the exhaustive treatment of the whole subject by one author being now impossible." It is presented "in an enlarged form as an advanced textbook." The contents are introduction, respiration, polysaccharides, the fermentation of hexoses, the decomposition of proteins, the metabolism of nucleic acid, nutrition and growth, nitrogen fixation, autotrophic bacteria, bacterial photosynthesis, and enzyme variation and adaptation.

Photochemical studies of rancidity: The mechanism of rancidification, M. R. COE. (U. S. D. A.). (*Oil & Soap, 15 (1938), No. 9, pp. 230–236, figs. 2*).—According to the theory here set forth, rancidification has its origin in a disrupted photosynthesis in the case of vegetable oils and the photosensitizing action of hemoglobin or other animal pigment that may be present in small amounts in animal fats such as lard. Nascent hydrogen is believed to be lib-

erated from the photosensitizer (chlorophyll or animal pigment) which unites with molecular oxygen to form loosely combined or nascent hydrogen peroxide. This unstable peroxide unites with the unsaturated bond of the triglyceride to form a glyceride peroxide which in turn splits into an aldehyde and forms the rancid compound. It is pointed out that this theory accounts for some phenomena heretofore not readily explained.

The author also shows that the ability of an oil to absorb added chlorophyll, combined with the appearance of its fluorescence, may be used to indicate the susceptibility of an oil to become rancid.

A rapid method for determining moisture in roughages, C. F. Monroe and A. E. Perkins. (Ohio Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 1, pp. 37–39, fig. 1*).—In the method described, samples are dried rapidly by forcing heated air through the material. Drying in this manner for from 10 to 30 min. gave results in close agreement with those obtained by the usual oven method of drying for 24 hr. at 100° C.

Determining salt content of cheese, O. R. Overman and B. F. Whitmore. (Univ. Ill.). (*Natl. Butter and Cheese Jour., 30 (1939), No. 2, pp. 18, 34, 35*).—A method is described for determining the salt content of cheese, in which the sample of cheese is digested in strong sulfuric acid in a side-arm distilling flask and the liberated hydrogen chloride absorbed in a measured volume of a standard solution of silver nitrate. The results obtained by this method checked closely with those found by the official method, and its use in commercial laboratories seemed preferable because of its simplicity and rapidity in manipulation.

A micromethod for the determination of iron in blood, R. Breuer and W. E. Militzer. (Univ. Nebr.). (*Jour. Biol. Chem., 126 (1938), No. 2, pp. 561–566*).—Fading of ferric thiocyanate is caused by the evolution of hydrogen sulfide from the decomposition of the thiocyanate ion. This reduces the ferric ion to the ferrous ion, which gives no color with thiocyanate. The decomposition is hastened by light and by a strong acid medium. The color can be stabilized for several hours even in strong acid by placing the solutions in the dark and by adding an oxidizing agent to oxidize the hydrogen sulfide. The stabilizers that have been mentioned in the literature are nitric acid and potassium persulfate. Of the oxidizing agents tried, potassium persulfate was best, since it has only a small tendency to oxidize the thiocyanate to free sulfur. Hydrogen peroxide was also satisfactory but had a greater tendency to produce free sulfur.

The method described involves oxidation of the blood sample with potassium permanganate in the presence of sulfuric acid, decolorizing of the excess permanganate by hydrogen peroxide, and colorimeter comparison of the thiocyanate color with that of a standard thiocyanate prepared by a like method. The procedure requires 0.1 cc. of blood. The data given show recoveries of from 92.5 to 98 percent of the iron present.

Maple syrup making object of study, C. O. Willits (*Farm Res. [New York State Sta.], 5 (1939), No. 2, pp. 1, 2*).—Methods of manufacture of maple sirup and sugar are very briefly outlined, with some possible improvements, and suggestions as to the future of the manufacture of these products in New York State.

Sugar and starch products from corn, W. B. Newkirk (*Contrib. Iowa Corn Res. Inst. [Iowa Sta.], 1 (1939), No. 2, pp. 213–218*).—This is a summary of progress already made in the development of industrial uses of cornstarch and sugar and their modifications and derivatives and of work still in progress.

Possibility of a domestic root starch industry, H. G. KNIGHT. (U. S. D. A.). (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*], *1* (*1939*), *No. 2, pp. 219–222*).—This is an address largely occupied with outlining the work of the U. S. D. A. Bureau of Chemistry and Soils on production of good quality starch free from yellow color from sweetpotatoes. It is pointed out that the product made in the experimental plant of the bureau meets the root-starch demands of various industries.

The production of caproic and butyric acids by the methane fermentation of ethyl alcohol, H. A. BARKER. (Univ. Calif.). (*Arch. Mikrobiol.*, *8* (*1937*), *No. 4, pp. 415–421, fig. 1*).—The author reports upon a fermentation of ethyl alcohol under the influence of *Methanobacterium omelianskii* and an associated spore-forming bacterium, the alcohol being converted into acetic, butyric, and caproic acids, with a concomitant reduction of carbon dioxide to methane. The data indicate the formation of butyric and caproic acids by a condensation of a C_2-compound which probably is acetaldehyde.

Effect of temperature of digestion, chemical composition, and size of particles on production of fuel gas from farm wastes, G. H. NELSON, R. P. STRAKA, and M. LEVINE. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 4, pp. 273–287, figs. 3*).—The rate and quantity of gas produced by the anaerobic decomposition of chopped cornstalks, chopped wheat straw, ground wheat straw, cornstalk flour, filter paper, seed flax straw, artichoke-top flour, cook liquor from wall board manufacture, and alkali lignin were determined at from 28° to 30° and from 50° to 55° C. With artichoke-top flour and seed flax straw, the rate of digestion at from 28° to 30° was not appreciably different from that at from 50° to 55°. With filter paper and cook liquor the same quantity of gas (300 cc. per gram of volatile solids) was produced in about one-third of the time at from 50° to 55°. With cornstalk flour and chopped wheat straw it required approximately half as long to produce 300 cc. of gas at 55° as at from 28° to 30°. With ground wheat straw the digestion time was reduced about one-third by employment of the higher temperatures, while with chopped cornstalks only about one-quarter of the digestion period was necessary at from 50° to 55° as at from 28° to 30° to produce the same amount of gas. The effect of temperature on the rate of digestion of fibrous farm wastes was more marked with coarser materials, such as chopped cornstalks and chopped wheat straw, than with finer materials, such as cornstalk flour and ground wheat straw.

AGRICULTURAL METEOROLOGY

[**Papers on meteorology at the nineteenth meeting, American Geophysical Union**] (*Amer. Geophys. Union Trans.*, *19* (*1938*), *pt. 1, pp. 134–156, 159–171, 172, 173, 174–176, figs. 42*).—The following are of interest to meteorology: Measurements of Ultra-Violet Solar Radiation in Puerto Rico, by G. W. Kenrick and H. Ortis (P. R. Col. Expt. Sta.); A Year of Ultra-Violet Measured with a Dosimeter at Blue Hill, by D. L. Arenberg; The Meteorological Aspects of Certain Radio-Transmission Phenomena, by G. W. Kenrick and G. Lavergne (P. R. Col. Expt. Sta.); Progress in Compiling and Summarizing Ships' Weather-Observations, by I. R. Tannehill (U. S. D. A.); Meteorological Research Contemplated for an Expedition to North Greenland, by M. Demorest; The Velocity of Sound-Waves From Gun-Fire in Southern California, by B. Gutenberg; Solenoidal Circulations [of the Atmosphere] Resulting From Lateral Mixing, by C.-G. Rossby; The Intensity of Lateral Mixing in the Atmosphere as Determined From Isentropic Charts, by G. Grimminger (U. S. D. A.);

Wave-Distribution in a Homogeneous Current [Atmosphere and Ocean], by C. L. Pekeris; Mean Monthly Isentropic Charts and Their Relation to Departures of Summer Rainfall, by H. Wexler and J. Namias (U. S. D. A. et al.); On the Thermodynamic Interpretation of Isentropic Charts, by H. R. Byers, and On the Use of Isentropic Cross-Sections, by C. H. Pierce (both U. S. D. A.); Characteristics of the Littoral Water and Weather Along the Pacific Coast of Colombia and Ecuador, by R. C. Murphy; and The Forecasting Significance of Anticyclonic Eddies on the Isentropic Chart, by J. Namias.

Monthly Weather Review, [**November–December 1938**] (*U. S. Mo. Weather Rev., 66 (1938), Nos. 11, pp. 351–399, pls. 9, figs. 15; 12, pp. 401–442, pls. 11, figs. 7*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the article noted on page 169 and the following contributions:

No. 11.—Sounding-Balloon Observations Made at Omaha, Nebr., During the International Months June 1935, November 1936, and August 1937, and Winds Observed During July 1938, by J. C. Ballard (pp. 369–375); Distribution of Air-Mass Types and Frequency of Change in the Western United States During 1937–38, by A. C. Gerlach (pp. 376, 377); and West Indian Disturbance of November 6–10, 1938, by W. E. Hurd (p. 378).

No. 12.—A Solution to the Problem of Adjusting the Counterbalance of a Shipboard Theodolite, by A. R. Stickley (pp. 401–412); Preliminary Reports on Tornadoes in the United States During 1938, by J. P. Kohler (pp. 412–414); and North Atlantic Tropical Disturbances of 1938, by W. E. Hurd (pp. 414, 415)

[**Meteorological studies and observations by the Florida Station**]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1938, pp. 129–136, 149–151, 174, 175, figs. 3*).—Brief reports are given relative to the horticultural protection service, including temperature surveys, forecast and frost warning service, and distribution and accuracy of forecasts, by E. S. Ellison; water control experiments, and meteorological records at the Everglades Substation; and meteorological records, and climatic factors in relation to crops at the North Florida Substation.

A density channel for illustrating fronts and occlusions, B. C. Haynes (*Bul. Amer. Met. Soc., 20 (1939), No. 2, pp. 37, 38, figs. 7*).—An apparatus for demonstrating and illustrating meteorological fronts and occlusions is described, the density channel consisting of plate glass sides, fitted with metal heating pads on the floor and measuring 30 by 4 by 6 in.

Some long-range forecasting methods and activities in Europe, I. I. Shell (*Bul. Amer. Met. Soc., 20 (1939), No. 2, pp. 44–48*).—A review of recent research and results in long-range forecasting, with special reference to Germany, Russia, and England.

Atmospheric ozone as a possible meteorological factor, C. L. Pekeris. (U. S. D. A. et al.). (*Bul. Amer. Met. Soc., 20 (1939), No. 1, pp. 3–10, figs. 8*).—An attempt is here made to survey the existing evidence (18 literature references) for correlations between variations in atmospheric ozone and the state of the stratosphere and of the trophosphere.

Evaporation from the land surfaces of the earth in relation to temperature and precipitation [trans. title], W. Wundt (*Ztschr. Angew. Met., Wetter, 56 (1939), No. 1. pp. 1–9*).—The annual evaporation from the land surfaces of the earth in relation to precipitation and mean temperature is presented in tabular form and discussed, including the methods used in obtaining and interpreting the data.

Temperature and vapor pressure as factors in tornadic inception in eastern Nebraska, H. LEMONS. (Univ. Nebr.). (*Bul. Amer. Met. Soc., 20 (1939), No. 2, pp. 49, 50*).—The records presented and discussed are believed to indicate the possibility of a relationship of temperature and vapor pressure with tornadic inception but not the inference that such relationship always exists.

Weather preceding forest fires in New Hampshire, L. LANSING (*Bul. Amer. Met. Soc., 20 (1939), No. 1, pp. 10–26*).—Close analyses of the weather conditions preceding five dates on which large or numerous fires occurred definitely indicate that certain combinations of such conditions have been typical when large fires have occurred. On the basis of the results reported special precautions are indicated following a precipitation deficit of ±70 percent or more for 7–10 days combined with a high percentage of clear weather (70 percent or more of the possible sunshine), low relative humidity (below 65 percent at 8 a. m., and below 45 percent at noon), high winds for several days, and above normal maximum temperatures.

Considerations of phenological practice [trans. title], A. A. ORTIZ (*Jor. Agron. y Vet., Univ. Buenos Aires, 1937, pp. 115–123*).—The author presents his general concept with a system of procedure as a basis for practical phenological studies, including the general climate, climatic variants with latitude and altitude, and agricultural climates and regions.

Bioclimatics: The what and why, E. N. M[UNNS] (*Chron. Bot., 5 (1939), No. 1, pp. 5–8*).—An analysis, based on Hopkins' work (E. S. R., 78, p. 753), of this hardly scratched field of scientific research of great potential service to forestry, agronomy, horticulture, soil science, economic entomology, plant pathology, and other fields of applied biology.

Climatic research in the Soil Conservation Service, C. W. THORNTHWAITE, B. HOLZMAN, and D. I. BLUMENSTOCK (*U. S. Mo. Weather Rev., 66 (1938), No. 11, pp. 351–368, figs. 11*).—"Climatic work carried on as an integral part of the research program of the Soil Conservation Service has clearly demonstrated the need for a variety of specialized climatic investigations into soil erosion problems. Many of these climatic problems have already been undertaken, several have been completed, but there are still numerous questions which, while clearly recognized, have yet to be subjected to study. General climatic considerations are useful in defining 'erosion regions' and in treating the element of climatic risk. Analyses of precipitation records in terms of storm duration, intensity, and storm area have been undertaken and are being directly related to field phenomena. Drought is being considered as a type of climatic risk particularly significant in the Great Plains and the semiarid West. Temperature in its bearing on climatic risk and weathering processes is also being scrutinized. Likewise, a consideration of the flood problem in its bearing on erosion hazards requires studies of excessive precipitation, actual evaporation from various types of land surfaces, and soil-moisture deficiency. Thus, in a wide variety of ways, a number of climatic studies are being carried out. That climate is an inseparable major theme in the soil erosion complex is clear. The objective is to orient the climatic work in such a way that results of maximum practical value will be obtained."

SOILS—FERTILIZERS

[Soil investigations by the California Station]. (Partly coop. U. S. D. A.). (*California Sta. [Bien.] Rpt. 1937–38, pp. 2–9, pls. 2*).—These are noted briefly under the captions natural land classifications, cover crops prove efficient in erosion control, use of mechanical controls, drainage problems again trouble-

some, alkali lands reclaimed, soil permeability studies, and irrigation and soil salts.

[Soil investigations by the Delaware Station] (*Delaware Sta. Bul. 214 (1938), pp. 20, 21, 45*).—The effect of degree of base-saturation upon the fixation and availability of phosphorus and potassium in soils is dealt with by G. M. Gilligan; and work on the influence of minor elements on the soil flora is reported by T. F. Manns and R. Russell.

[Soil and fertilizer work of the Florida Station] (*Florida Sta. Rpt. 1938, pp. 140–142, 153, 154, 156, 157, 169, 170*).—The following topics are briefly discussed: Nutrient salt concentration in the soil, with special reference to the trace elements, by R. B. French; citrus soils investigations, by M. Peech; soils investigations, including water-holding power, green manuring, loss of soil by oxidation, and the role of special elements in the Everglades, by J. R. Neller and W. T. Forsee; physiological phases of plant nutrition, with special reference to moisture and aeration relation and phosphorus content, by Neller; and relation of organic composition of crops to growth and maturity, by Forsee.

[Soil investigations by the Washington Station]. (Partly coop. U. S. D. A. et al.). (*Washington Sta. Bul. 368 (1938), pp. 17–22, 89–91*).—The following topics are briefly reported upon: Fertility investigations of Washington soils, by L. C. Wheeting, S. C. Vandecaveye, and L. E. Dunn; the maintenance of organic matter in eastern Washington soils, by Vandecaveye, Wheeting, and L. T. Kardos; hardpan formation in the irrigated soils and changes occurring in irrigated soils as a result of irrigation, cropping, and fertilizer treatments, both by Wheeting and Vandecaveye; fertility of irrigated soils, by Vandecaveye, Wheeting, and H. P. Singleton; maintenance of organic matter in central Washington, by Wheeting, Vandecaveye, and H. D. Jacquot; investigations of the effect of accumulations of arsenical sprays in orchard soils, by Kardos, Vandecaveye, and C. M. Keaton; and fertility investigations of greenhouse soils, by Wheeting and Dunn.

From the Soil Conservation Substation brief reports on effect of plant cover on run-off and erosion, movement and balance of soil moisture, cropping practices in relation to erosion control, and tree planting for erosion control are contributed by G. M. Horner, and tillage and cultivation practices for erosion control and terracing studies, by Horner and L. M. Naffziger.

A mixer and sampler for greenhouse soils, R. L. Cook. (Mich. State Col.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 171–174, fig. 1*).—The mixer consists of a 15-in. cubical sheet metal box with rounded corners and with a 0.5-in. steel shaft passing through diagonally opposite corners. A crank on one end of the shaft is used to turn the mixer. The cover, consisting of about three-fourths of one side of the mixer, is on hinges and is fastened by means of screw clamps which slip apart as soon as they are loosened. A rubber gasket keeps the soil from sifting out. To hasten the mixing, two 3-in. triangular baffle plates are welded into the edges opposite the cover and half way between the corners. These plates carry a portion of the soil up and allow it to fall on the remainder.

The sampler consists essentially of a square funnel in 16 in. at the top and 3 in. at the bottom and a pyramid 17 in. high with a 12-in. square base. The funnel is fitted with a slide to hold the soil. The edges of the pyramid are turned out a distance of 1.5 in., and one side is fitted with a piece of metal so arranged as to direct soil into a small tray. The height of the frame (1.5-in. angle iron) is 38 in., the funnel coming down over the top of the pyra-

mid. When the slide is quickly removed the soil is divided into four almost equal portions, of which one is caught and returned to the funnel for another quartering.

Soil analysis: A handbook of physical and chemical methods, C. H. WRIGHT (*London: Thomas Murby & Co.; New York: D. Van Nostrand Co., 1939, 2. ed., pp. X+276, figs. 10*).—Additions to the methods presented in the first edition (E. S. R., 71, p. 591) include the freezing point, the glass electrode, the antimony electrode, inorganic soil colloids, and the determinations of zinc and cobalt in soils. The analysis of the clay fraction and the determinations of calcium and exchangeable potassium have been entirely rewritten. By abbreviation of many passages and the omission of some methods either out-of-date or of minor importance the author has avoided any great increase in the size of the book. The contents are an introduction, part 1 on physical methods, part 2 on general chemical methods, part 3 on special chemical methods, and appendixes giving related data and factors, together with author index and subject index.

Determining by plant response the retention of nutrient ions by soils, J. P. CONRAD and C. N. ADAMS. (Univ. Calif.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 1, pp. 29–34, fig. 1*).—The authors describe an experimental technic consisting essentially in arranging three or more pots of soil one above another, allowing the solution of the nutrient the absorption of which should be tested to percolate through and drop from the pots in succession, and determining by growing a test crop in each pot in which of the pots the nutrient was retained in a quantity sufficient to affect plant growth.

Experiments of this nature indicated that the nitrate ion is not retained, whereas the ammonium ion as supplied either by ammonium hydroxide or by ammonium sulfate remained in the uppermost layer of the soil. Sodium nitrite produced a uniform toxicity in the first planting, followed by uniformly good growth of a planting made 8 days later after time for oxidation to nitrate had elapsed. The phosphate ion as supplied by sodium hydrogen phosphate was absorbed in the top pot to such a degree that the growth of milo in the top pot was between four and five times that occurring in either the second or the third. Treatment of a sulfate-deficient soil by percolation with sodium sulfate solution showed no evidence of retention in any of the three pots.

St. Clair County soils, G. D. and L. H. SMITH (*Illinois Sta. Soil Rpt. 63 (1938), pp. [1]+36, figs. 9, maps 3*).—This adds 426,000 acres to the total area examined in the State soil survey (E. S. R., 80, p. 12).

Soil survey of Wheeler County, Nebraska, B. ABASKIN and F. A. HAYES. (Coop. Univ. Nebr.). (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1933, No. 5, pp. 35, fig. 1, map. 1*).

Land facts on the southern plains, G. K. RULE (*U. S. Dept. Agr., Misc. Pub. 334 (1939), pp. [4]+22, figs. 13, map. 1*).—This is a nontechnical description of the soil conditions and needs found and the treatments demonstrated in region 6 (the southern Great Plains) by the Soil Conservation Service. An attached map covering 10 problem-area groups "represents the first attempt to isolate and label those bodies of land where the soil, climate, and appropriate farming practices are somewhat similar."

Problem-area groups of land in the southern Great Plains, H. H. FINNELL (*U. S. Dept. Agr., [Soil Conserv. Serv.], 1939, pp. [1]+40, map. 1*).—For each of the problem-area groups mentioned there are given approximate acreage, description of the physical factors of soils, physiography, and the erosibility of the soils, together with recommended conservation practices, including crop management, land retirement, soil management, water conservation, and other

measures appropriate to the individual land type. An appendix shows, in tables, the acreage, distribution, present use, principal physical factors, and degree of erosion in each problem-area group, and the recommended land use adjustments and water-conservation measures in each State for all problem-area groups.

Erosion and related land use conditions on the Minot area, North Dakota, N. Holowaychuk and W. C. Boatright (*U. S. Dept. Agr., [Soil Conserv. Serv.], (1938), pp. [1]+37, pls. 3, figs. 6, maps 5*).—The area here dealt with comprises four counties in northern North Dakota and contains 4,174,080 acres, the most erosible soils being the dune sands and the light-textured Thurman soil series.

No apparent erosion was found on 15.7 percent of the area, slight erosion on 67.3, moderate on 12.5, severe on 2.8, and very severe erosion on 1.7 percent. Wind erosion is more serious than water erosion. Most of the serious wind erosion has occurred on the light-textured soils and wind-erosion control practices are most essential, but water-erosion control practices, also necessary, will provide at the same time for moisture conservation. Serious water erosion is found on sloping areas of medium- and light-textured soils. Moderate wind and water erosion occurs on medium- and heavy-textured soils on level land. Nearly all serious erosion is on cultivated or idle land.

An unusual alkali soil, W. P. Kelley and S. M. Brown. (Calif. Citrus Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 1, pp. 41–43*).—The titration behavior of a water extract of the soil, described after neutralizing the separate samples of the extract with standard acid to the end point of phenolphthalein and of methyl orange, respectively, together with a determination of the pH value of the extract (10.75) and its content of various anions and cations (the latter consisting predominantly of sodium), showed that the soil owes a considerable proportion of its alkalinity to sodium silicate. A 1:5 water extract contained 374.9 mg. per liter of silicon calculated as the dioxide as against 255 mg. per liter of the carbonate ion as CO_2.

The soil was found at Vale, Oreg. "The exceptional feature of this soil is that it contains a substantial amount of sodium silicate in addition to soluble carbonate and the other salts common to alkali soils. Although it is common to find soluble SiO_2 in black alkali soils, the amount is usually small. This Oregon soil, however, contains relatively much soluble silica. Therefore, the geological and pedological history of this soil is a matter of some interest."

Observations regarding soils of northern and central Mexico, J. T. Miller and I. C. Brown. (U. S. D. A.). (*Soil Sci., 46 (1938), No. 6, pp. 427–451, pl. 1, fig. 1*).—The authors describe six profiles of zonal and intrazonal soils, presenting the results of chemical analyses of the various horizons and of their colloids, the data including percentages of silica, iron, aluminum, magnesium, calcium, potassium, sodium, titanium, and manganese as the oxides, phosphoric and sulfuric anhydrides, loss on ignition, organic matter as determined by a combustion method, carbon dioxide content of the soil carbonates, and nitrogen. Soluble salts and selenium are given in parts per million. The pH values were determined by hydrogen electrode and by glass electrode methods.

The authors found that these six soils have their counterparts in the United States with respect to both profile development and character of colloid present. "In Mexico the great soil groups are represented in a comparatively limited area. This is due to the great differences in local relief and the attendant differences in climate and vegetation."

Soil improvement in the Sudan Gezira, H. Greene and O. W. Snow (*Jour. Agr. Sci. [England], 29 (1939), No. 1, pp. 1–34, figs. 4*).—Ferrous sulfate, calcium sulfate, potassium sulfate, and sulfur, used in conjunction with ammonium

sulfate, effected temporary increases in water penetration, nitrogen supply, and yield, but the improvements were not permanent.

Saltbush analyses indicated that this plant removes much sodium from the soil, but that its use could not be expected to effect practical improvement in a soil of comparatively high sodium content. "On the other hand, it appears that by including saltbush in rotation and by removing the crop from the land it is possible to guarantee that no progressive deterioration will occur in consequence of accumulation of sodium introduced in the irrigation water."

Physical characteristics of soils.—II, Expressing mechanical analysis and state of aggregation of soils by single values, A. N. and B. R. PURI (*Soil Sci., 47 (1939), No. 1, pp. 77–81, figs. 3*).—In continuation of a previous study (E. S. R., 79, p. 17), the author points out that there are three "single-value" constants derivable from the summation or distribution curves obtainable in the mechanical analysis of soils, namely, the weighted mean size, the standard deviation (σ), and a constant based upon the fact that "if . . . the area A lying above and to the left of the summation curve is divided by the area B lying below and to the right of the summation curve, the fraction A/B remains constant as long as the limit 0 and 1 remains unaltered. . . . The constant is referred to as the Schoklitsch number, or K, and when not otherwise specified is taken to refer to diameters lying between 0 and 1 mm." The authors consider that these values should replace the descriptive terminology generally employed for characterizing soil texture. State of aggregation can be satisfactorily expressed by the ratio of these single values before and after dispersion of the soil.

A critical survey of investigations on the "wilting coefficient" of soils, J. V. BOTELHO DA COSTA (*Jour. Agr. Sci. [England], 28 (1938), No. 4, pp. 630–643*).—In a review of contributions on this subject the author finds the original conclusions (1) that the wilting coefficient is independent of the kind of plant used as indicator, and (2) that the coefficient is independent of ordinary variations of growth to be substantiated by subsequent work; but the assumption that the wilting coefficient is directly related to other soil constants has been exploded. Conclusions (1) and (2) "are substantially correct for hygrophytes and mesophytes." It is further noted that "an important factor making for the substantial constancy of the wilting coefficient for a given soil is the extreme steepness of the curve connecting suction pressure and soil moisture content, in consequence of which differences of suction pressure of unquestionable significance from the standpoint of plant physiology give rise to differences in soil moisture content that are too small to be detected."

The indirect determination of the "wilting coefficient" by the freezing-point method, and the influence of the salts upon the pF at that critical moisture content, J. V. BOTELHO DA COSTA (*Jour. Agr. Sci. [England], 28 (1938), No. 4, pp. 654–662, figs. 2*).—The pF at the wilting coefficient, as measured by the modified freezing-point method, varied from 4 to 44, approximately, with an average of 4.2.

"The variation observed bears no relation to the soil texture, neither can it be explained by uncertainties in the freezing-point determinations which have proved to be accurately reproducible. Freezing-point measurements after leaching, conductivity measurements, and freezing-point determinations in saturated soil and at the moisture equivalent proved that part of the variation is due to the presence of soluble salts, the more saline soils having a higher pF at the wilting coefficient. When the salt content does not exceed about 500 p. p. m. the influence of the salts is hardly detectable, and the pF at the wilting coefficient lies between 4 and 4.3." Because of unavoidable errors in the wilting

experiments and other factors, "a variation of 0.3 pF units can be considered very small. It can therefore be confidently concluded that in ordinary agricultural soils with a salt content of less than about 500 p. p. m. permanent wilting occurs when a critical pF value (lying between 4 and 4.3) is reached."

The measurement of pF in soil by freezing-point, R. K. Schofield and J. V. Botelho da Costa (*Jour. Agr. Sci. [England], 28 (1938), No. 4, pp. 644–653, fig. 1*).—The authors describe two modifications of the procedure of Bouyoucos and McCool (E. S. R., 34, p. 721), of which the first employs three separate freezing mixtures and other elaborations to provide a more delicate control of the degree of supercooling and to minimize the cooling due to surroundings while freezing is in progress. The second procedure is substantially the same as that used by Bouyoucos and McCool.

Determination of the weight of water in a soil or subsoil mass in which the moisture content increases with distance from a plant or group of plants, M. L. Jackson and M. D. Weldon. (Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 116–127, figs. 9*).—With the plant at the origin and with the use of polar coordinates, the authors derived equations for the summation of the water content of squares in the case of equal spacing of rows and of plants in the row, rectangles when the rows are farther apart than the plants in the row, and hexagons in the case of alternate spacing. The derivation given involved successive integrations with respect to two variables, but the solution is in terms of definite integrals giving in each case a final formula the use of which involves only simple arithmetic.

Snow ridging to conserve moisture and decrease erosion, H. F. McColly and W. H. Farmer (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 4, pp. 32–35, fig. 1*).—The authors found that the use of snow plows and crowders to build up ridges 18 in. high from a 5-in. snowfall resulted in holding much snow on the fields, while similar areas not ridged were blown clean of snow after a thaw freeze and second drifting fall of snow. With falls of less than 5 in. the authors consider that a second ridging may be necessary to build up ridges of a sufficient depth. The best results were obtained by ridging at a temperature high enough to make the snow damp. The ridges should not be more than 8 ft. apart if they are to prevent wind removal and on level ground should be made across the prevailing direction of the wind. On rolling ground, however, contour ridging should be practiced. Not only did the ridges hold snow from blowing but the ice strips formed under the ridges helped to prevent draining off of water during thaws.

Equipment suggested included a push plow driven by a large tractor capable of drawing two pull plows offset back of the drawbar. Less elaborate plows can be made in a good farm shop at a cost of about $25 even when all material must be bought new.

Soil temperatures under 6, 12, and 24 in. of snow are recorded.

The mechanism of cation exchange in the montmorillonite-beidellite-nontronite type of clay minerals, J. E. Gieseking. (Ill. Expt. Sta.). (*Soil Sci., 47 (1939), No. 1, pp. 1–13, pl. 1, figs. 4*).—Minerals of the montmorillonite-beidellite-nontronite type were found to adsorb large substituted ammonium ions, giving rise to (001) spacings greater than those of the same minerals saturated with such smaller cations as calcium or hydrogen. The diffracted radiation from the (001) planes of these minerals, treated with the complex cations, was much more intense than the same diffraction from the calcium and hydrogen systems. A gradual increase in the amount of complex cation added to montmorillonite systems resulted in increases in (001) spacings and intensity

of diffraction from these planes to a maximum. These results indicated that a portion of the complex cations were adsorbed within the variable (001) spacings of the minerals.

The large complex cations used in this investigation were very strongly adsorbed by montmorillonite. They were found to be exchanged by other cations of approximately the same size, but they were not exchanged by hydrogen, which is very effective in replacing small cations. The substituted ammonium cations were found to be very effective in flocculating the dispersed clays. Montmorillonite saturated with the large substituted ammonium ions did not show the water adsorption, swelling, and dispersion characteristic of Ca-, Na-, and H-montmorillonite. The (001) spacings of the complex ammonium systems did not vary with the water content of the system.

The stimulating effects of silicates on plant yields in relation to anion displacement, S. J. Toth. (N. J. Expt. Stas.). (*Soil Sci., 47 (1939), No. 2, pp. 123–141, pl. 1*).—The author reports an investigation of the displacement of adsorbed phosphate ions from Colts Neck loam, the displacing anions being the hydroxyl, the silicate, the silicate of pH 7, and the sulfate. A replacement of the adsorbed ions took place in solutions of anions that possess high pH values, namely, the hydroxyl and the silicate. Under this condition degradation of the phosphated soil complex resulted. The displacement of the adsorbed phosphate ion seemed to be independent of the silicate-ion concentration but was dependent upon the pH. The displacing anions were classified into two groups with reference to the mobilization of the phosphate ions. Group one contained the hydroxyl and silicate ions, group two the silicate at pH 7 and sulfate ions. The solutions of anions of the first group were associated with high pH values and large displacements of the adsorbed ion; the anions of the second group did not effect any marked release of the phosphate ion. A definite increase in yield of barley and Sudan grass was noted when these crops were grown on soil to which calcium or magnesium silicate was added. There was no relation between the available phosphate contents of the soils and yields from the pots. Slight changes in the SiO_2, P_2O_5, CaO, and MgO content of the crops when grown on silicated soils were noted. There was a very marked absorption of silica by rape, barley, and Sudan grass when these plants were grown on silicated soils.

Action of carbon dioxide on soils, A. N. Puri and H. L. Uppal (*Soil Sci., 46 (1938), No. 6, pp. 467–471*).—The action of CO_2 on soils has been studied by following the changes in the pH values. The importance of CO_2 in the reclamation of alkali soils is brought out by the observation that CO_2 induces changes that are the reverse of those involved in the process of alkalization.

Chemical nature of organic matter in differently cropped arid soils, K. R. Stevens. (Utah Expt. Sta.). (*Soil Sci., 47 (1939), No. 1, pp. 27–31*).—Samples taken from adjacent plats which had supported continuous fallow, oats, and alfalfa, respectively, for 25 yr. were somewhat high in the ether- and alcohol-soluble fraction. The "protein" and "lignin-humus" fractions were high. The carbohydrate fraction was unusually low. The ether- and alcohol-soluble and carbohydrate fractions decreased with depth for the three plats. The protein fraction decreased with depth for the fallow and oats plats but increased with depth for the alfalfa plat. The lignin-humus fraction increased with depth in the fallow plat but decreased with depth in the oats and alfalfa plats.

Bacteria in the soil (*New York State Sta. Rpt. 1938, p. 12*).—Observations of an inhibitive effect of air-dry storage of soil upon the subsequent growth of soil bacteria, an effect which may interfere with the use of micro-organisms as indicators of soil nutrient deficiency, are briefly noted.

Thermophilic actinomycetes and fungi in soils and in composts, S. A. WAKSMAN, W. W. UMBREIT, and T. C. CORDON. (N. J. Expt. Stas.). (*Soil Sci., 47 (1939), No. 1, pp. 37–61, pls. 4*).—The authors found thermophilic actinomycetes growing at 50° and at 65° C. and also at 28° abundantly in variously treated field soils, those receiving stable manure containing larger numbers of these organisms. The most abundant of the thermophilic fungi found belonged to the *Thermomyces*. It grew well at 50° but not at 65°, producing dark chlamydospores on short side branches. Among the thermophilic actinomycetes six distinct types were recognized, belonging to the two genera *Actinomyces* and *Micromonospora*.

Influence of temperature upon the microbiological population and decomposition processes in composts of stable manure, S. A. WAKSMAN, T. C. CORDON, and N. HULPOI. (N. J. Expt. Stas.). (*Soil Sci., 47 (1939), No. 2, pp. 83–113, pls. 7, figs. 2*).—A temperature of 75° C. was found to be unfavorable to biological decomposition of horse manure. Only the hemicelluloses were decomposed to any considerable extent. The cellulose was not attacked at all, the increase in proteins was limited, and only a part of the lignin was brought into solution. The most rapid decomposition of the manure set in at a temperature of 65° followed by that at 50°. After the first stages of rapid decomposition the process was found to proceed more rapidly at 50° than at 65°. At 28° there was a considerable delay before active decomposition set in, but after a lapse of 9 or 10 days the manure began to decompose rapidly as a result of the development of an extensive microbiological population. The groups of organisms active at these various temperatures are described.

The nitrogen in the manure was conserved only when immediate decomposition set in. This resulted in a rapid break-down of the carbohydrates and the transformation of the soluble nitrogen into insoluble forms. Whenever decomposition was delayed, either because of too low or too high temperatures, losses of the volatile forms of nitrogen occurred.

Leaching studies with various sources of nitrogen, N. BENSON and R. M. BARNETTE. (Fla. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 1, pp. 44–54*).—The authors used small, percolation-type lysimeters to determine the leaching of nitrogen in the form of nitrate, nitrite, urea, and ammonia from Norfolk sand after treatment with several nitrogenous materials. An equivalent of 408 mg. of nitrogen was applied to 10 lb. of surface soil and placed in a pot on top of 20 lb. of moistened subsoil. The cultures were established and allowed to stand for 1, 4, 10, and 21 days before being leached with 5 l. of distilled water yielding 3 in. of drainage water for the surface exposed.

All nitrogen applied as nitrate and one-third of the nitrogen applied as ammonium sulfate or ammonium nitrate were leached. The leaching of the ammonium ion from ammonium phosphate was very low. Ammonium carbonate was retained very efficiently by the soil until nitrification began. Urea leached as such to the extent of 35 percent and 16 percent after 1- and 4-day incubation periods, respectively. Ammonium nitrogen was retained very efficiently by the soil until nitrification began. Then both ammonium and nitrate nitrogen leached. Very little difference was noted in the nitrogen content of the leachates from the untreated cultures and the cultures treated with the insoluble organic fertilizers.

A second series of cultures of four soil types were given sodium nitrate, ammonium sulfate, urea, castor pomace, and no treatment. All cultures were incubated for 4 days before they were leached with sufficient water to effect a quantity of drainage equivalent to 3 in. of water for the surface exposed. The nitrates leached almost completely except from Norfolk fine sandy loam,

which retained 27.8 percent in the soil. Of the ammonium nitrogen applied as ammonium sulfate, 40 percent leached from Norfolk sand, while insignificant amounts leached from the other soils. No urea was found in any of the leachates. The castor pomace treatment gave results very similar to those of the no-treatment cultures after 4 days. The leachates showed acidity greater than that of the soils. The pH value of the soil was increased by leaching. The most significant effect on the acidity of the soil was induced by urea, which materially raised the pH.

Effect of phosphates on nitrifying capacity of soils, G. S. FRAPS and A. J. STERGES. (Tex. Expt. Sta.). (*Soil Sci., 47 (1939), No. 2, pp. 115–121*).—Of 171 soil samples, 32 nitrified less than 60 percent of the ammonia-nitrogen added even though nitrifying organisms and calcium carbonate were added. Addition of phosphates increased the nitrifying capacity of most of these soils. Monocalcium phosphate alone increased the nitrification in 4 of 18 such soils. Monocalcium phosphate with calcium carbonate increased the nitrification percentage in 16 of the 18 soils over that attained with calcium carbonate alone. Dicalcium phosphate increased nitrification in 29 soils which did not completely nitrify when inoculating liquid and calcium carbonate were added. Nitrites were present in some of the cultures, but the number containing nitrites and the quantities of nitrite present were smaller when phosphates were added than when they were not added. The average order of decreasing effectiveness of phosphates in promoting nitrification in 14 soils was found to be as follows: Monopotassium phosphate, 20 percent superphosphate, dipotassium phosphate, monocalcium phosphate, tricalcium phosphate, dicalcium phosphate, disodium phosphate, rock phosphates, soft phosphate with colloidal clay.

There were differences in the quantities of the active phosphoric acid, acid-soluble lime, basicity, and pH values in the soils which responded to phosphates, but the prevailing characteristics seemed to be those of low active phosphate content and fair to high lime content and basicity.

The movement and fixation of superphosphate in soils, B. E. BEATER (*Soil Sci., 46 (1938), No. 6, pp. 453–466*).—The movement and fixation of superphosphate under field conditions in two distinct soil types was ascertained by applying superphosphate as top dressing under irrigation, as top dressing without irrigation, in the drill, and buried. Total, citric-soluble, and water-soluble phosphoric acid were estimated.

Erosion of total phosphate from surface dressings was considerable, being greater in the heavier soil type. In both soil types this was very greatly reduced by watering. Movement of total phosphoric acid could not be treated appreciably below the first inch from the surface, even in the lighter soil. Occasional penetration appeared to take place in fissures. Loss from the buried superphosphate occurred in neither the heavier nor the light soil. No movement below or above was detected in the buried fertilizer.

It was further found that "the fixation by analytical process in a heavy soil type is so much greater than that in a light soil as, perhaps, to obscure the results obtained. As a result, the fixation with time in a light soil stands out more clearly than that in a heavy type, although a heavier fixation in the heavy type actually takes place. . . . Water-soluble phosphate is lost in considerable amounts in process of estimation in a heavy soil type and in appreciable amounts in a lighter type."

Watering tended to prolong somewhat the availability of phosphate. After 14 days virtually all the water-soluble phosphate had disappeared from the heavy soil, but at the end of a year some still remained in the light soil, the loss

being very gradual. In a heavy soil type the increase in water-soluble phosphate, due to applications of 800 lb. superphosphate per acre, was almost negligible, whether the dressing had been applied in the soil or on the surface.

Phosphorus fixation by horizons of various soil types in relation to dilute acid extractable iron and aluminum, D. S. Romine and W. H. Metzger. (Kans. State Col.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 99–108, figs. 3*).—Extraction of "available" phosphorus by the Truog solution (E. S. R., 64, p. 312) reduced the capacity of the soil to absorb phosphorus. The percentage reduction in absorption after extraction of available phosphorus was highest in the relatively unleached soils. The percentage reduction in the A horizons was greater than in either the B or C horizons. In all horizons the reduction in "apparent absorptive capacity" (available phosphorus plus phosphorus absorbed by original soil) resulting from extraction of the soil by the Truog reagent varied with the general trend of the R_2O_3 extracted. The B and C horizons of rather heavily leached soils absorbed from two to five times as much phosphorus as did the B and C horizons of the relatively unleached soils. In all cases the B horizons showed greater absorption than the A horizons. In general, the lowest availability occurred in the B horizons. In the unleached profiles, high available phosphorus was associated with relatively high amounts of extractable R_2O_3. Low availability was associated with low pH values.

Phosphate investigations in Montana, 1938, W. P. Willis, Jr., and F. M. Harrington (*Montana Sta. Bul. 369 (1939), pp. 30, figs. 4*).—In experiments on alfalfa, sugar beets, wheat, and forage grasses, increased yield was usually accompanied by increased phosphate content in the crop plants. Soils showing phosphate deficiency in the Winogradsky test mostly showed phosphate response in the field. Residual effects on alfalfa in the second and third years after phosphating were observed. The lower lands showed more response than did bench lands or higher lands. Phosphating gave less increase in the wheat crop than in those of alfalfa or beets. The phosphate content of the grasses was markedly increased by available phosphates. Through 3 yr. the alfalfa and beets showed little response to raw phosphate rock.

In experiments on potatoes the number of tubers set, the yield, and the grade were all improved by the use of phosphate fertilizers. In one instance in the 1938 tests scab was materially less where phosphate had been applied.

The nature, extent, and distribution of fertilizer residues in the soil of some old fertility plats, W. H. Metzger. (Kans. Expt. Sta.). (*Soil Sci., 47 (1939), No. 1, pp. 15–26, fig. 1*).—This paper reports findings with respect to fertilizers applied as top dressings for continuous alfalfa during 27 yr.

A large proportion of the easily soluble phosphorus which accumulated in the soil as a result of treatment with various phosphorus carriers was found in the surface 4 in. of soil. There appeared to be accumulated phosphorus to depths of from 2 to 3 ft., however, in plats treated with rock phosphate and manure and with lime and manure and to a lesser extent in the superphosphate plat. Potassium salts, with or without sodium nitrate, applied with superphosphate resulted in more complete utilization of the phosphorus by the plants than did superphosphate used alone. Accumulations of total phosphorus in the surface 4 in. of soil and in immediately succeeding depths amounted to from 3 to 191 percent of the native phosphorus of the soil. Lime appeared to have brought about the retention of more of the phosphorus applied in the form of manure than where manure was applied alone, and at the same time it aided phosphorus penetration. In general, phosphorus applied in manure was largely utilized by the plants and little accumulated. Where superphosphate was applied, alone or supplemented, 70 percent or more of the accumulated

phosphorus was fixed in difficultly soluble form. Rock phosphate was much less strongly fixed, and at depths of from 1 to 2 ft. the accumulated phosphorus was entirely soluble in dilute acid. Except in the surface 4 in. of soil, phosphorus residual from manure was very largely fixed in difficultly soluble form.

The data did not show definitely that residual phosphorus increased the base exchange capacity of the soil. Lime and manure treatment brought about an appreciable increase, however, and this increased exchange capacity disappeared when the soil was electrodialyzed. Ultimate pH values were unaffected by the phosphorus treatments. The exchangeable sodium content of the soil was increased somewhat by a treatment involving $NaNO_3$, but most of the accumulation was at depths of from 1.5 to 3 ft.

The potassium treatments, which were light, left only very small residues confined to the upper 9 in. of soil. Exchangeable potassium appeared to have been maintained or accumulated more effectively than did total potassium. Limited data indicated that where total potassium was increased, as a result of treatments, from 77 to 96 percent of the accumulated potassium was fixed in nonexchangeable form.

Fertilizing constituents of cotton burs or cotton bur ashes and their effect on crop yields, H. J. Harper, H. A. Daniel, and G. W. Volk. (Okla. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 10, pp. 827–832*).—Three tons of burs applied at intervals of 3 yr. since 1926, either plowed or disked into the soil, have given as good returns as 6 tons on adjacent plats treated in a similar manner. The average seed cotton increase was 189 lb. per acre when the lightest application was plowed under and 166 lb. when disked into the soil. The highest average gain from the heaviest treatment was 170 lb. of seed cotton per acre. Ashes from equivalent amounts of burs produced only about one-half as great an increase in yield as the burs.

Cotton burs from 22 counties in Oklahoma contained an average of 8.73 percent ash, 1.04 nitrogen, 0.1 phosphorus, 0.65 calcium, 3.39 potassium, and 0.25 percent magnesium, calculated on a moisture-free basis. The average nutrient content of cotton bur ashes was found to be as follows: Phosphoric anhydride 2.68 percent, calcium oxide 10.41, potassium oxide 45.15, and magnesium oxide 4.76 percent.

Fertilizer placement for vegetable crops, H. H. Zimmerley. (Va. Truck Expt. Sta.). (*Veg. Growers Assoc. Amer. Ann. Rpt., 1937, pp. 34–47*).—Essentially similar material has been noted from other sources (E. S. R., 78, p. 166).

Commercial fertilizers, 1938, E. R. Tobey (*Maine Sta. Off. Insp. 169 (1938), pp. 39–89*).—The analyses of the 1938 inspection here reported include ammonia, nitrate, and organic nitrogen; the usual phosphate and potassium data; and both water-soluble and total-magnesium content when a guaranty of the last-named element was made. Single-element fertilizer compounds and liming materials are also covered in this report.

Inspection of commercial fertilizers for 1938, T. O. Smith and H. A. Davis (*New Hampshire Sta. Bul. 311 (1938), pp. 14*).—This report on the analyses for 1938 of 106 fertilizer materials deals with their composition and guaranty.

Fertilizer statistics for Texas, 1926–1938, G. S. Fraps and T. L. Ogier (*Texas Sta. Bul. 572 (1939), pp. 23, fig. 1*).—This bulletin contains statistics of fertilizer sold in Texas from 1926 to 1938. The tonnage of various grades, the selling price of the various grades, and the relation between the selling price and valuations are shown, together with the approximate cost of nitrogen, phosphoric acid, and potash in cents per pound for the past 12 yr.

Haven]); The Function of Ethylene in the Ripening Process in Apple and Banana, by R. C. Nelson (Univ. Minn.); The Use of Sectioned Plant Material to Detect Protopectinase, by O. Veerhoff (N. C.); Chemical Composition of Grain Sorghum Plants in Relation to Chinch Bug Immunity, by J. E. Webster and V. G. Heller (Okla. A. and M. Col.); The Internal Temperatures of Cotton Bolls, by D. B. Anderson (Univ. N. C.); The Activity of the Carbohydrases of *Phymatotrichum omnivorum* (Shear) Duggar, by P. J. Talley and L. M. Blank, Carbohydrate Utilization by *Phymatotrichum omnivorum* (Shear) Duggar, by L. M. Blank and P. J. Talley, Plant Alkaloids in Relation to *Phymatotrichum omnivorum*, by G. A. Greathouse, and Nitrogen and Carbohydrate Metabolism of Kidney Bean Cuttings as Affected by Treatment with Indoleacetic Acid, by N. W. Stuart (all U. S. D. A.); Peptidase Activity in the *Avena* Coleoptile, Phytohormone Test Object, by G. S. Avery, Jr., and K. Linderstrøm-Lang; Auxin is Not Produced in Roots, by J. van Overbeek; Nicotinic Acid as a Growth Factor for Isolated Pea Roots, by F. Addicott and J. Bonner; The Growth in the Hypocotyl of *Helianthus*, by W. A. Beck; Correlations Between Biological Essentiality and Atomic Structure of the Chemical Elements, by R. A. Steinberg (U. S. D. A.); Plant Development in Different Nutrient Solutions, by F. B. Chandler (Univ. Me.); Glycine in the Nutrition of Excised Tomato Roots, by P. R. White; Symptoms of Boron Deficiency in Citrus, by A. R. C. Haas (Calif. Citrus Expt. Sta.); Growth of Adventitious Roots of Tomato and Their Absorption of Nutrients in Air Dry Soil, by W. J. Himmel and A. K. Clark (Univ. Nebr.); Spectrographic Analysis Applied to the Study of Tobacco Frenching, by G. M. Shear and H. D. Ussery (Va.); Relation of Root Reserves to Control of European Bindweed (*Convolvulus arvensis* L.), by A. L. Bakke, W. G. Gaessler, and W. E. Loomis (Iowa State Col.); and A Study of the Chemical Composition of *Suckleya suckleyana* (a cyanogenetic plant in Colorado), by C. G. Barr, H. W. Reuszer, and F. Thorp, Jr. (Colo.).

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact., 37 (1939), No. 2, pp. 223, 224, 227, 230, 233, 234, 235*).—Abstracts of the following papers are included: Further Experiments in the Disinfection of Seeds, by A. W. Hofer and H. C. Hamilton (N. Y. State Expt. Sta.); Some Effects of Low Velocity Electrons on Microörganisms, by C. P. Haskins; A Simplified Apparatus for the Preservation of Bacterial Cultures in the Dried State, by F. J. Grabill and M. L. Cooper; Studies of Cacao Fermentation, by S. Hoynak, T. S. Polansky, and R. W. Stone (Pa. State Col.); and A Study of the Epidemiology of Tobacco Wildfire, by H. D. McAuliffe, M. A. Farrell, D. E. Haley, and J. J. Reid, and A Cultural and Serological Study of *Phytomonas tabaca* and Certain Related Forms, by J. J. Reid, J. Naghski, R. G. Harris, and H. D. McAuliffe (both Pa. Expt. Sta.).

Growth factor requirements of the root nodule bacteria, P. M. West and P. W. Wilson. (Univ. Wis.). (*Jour. Bact., 37 (1939), No. 2, pp. 161–185, pls. 3, figs. 7*).—*Rhizobium trifolii* synthesized all its essential organic substances from the simple ingredients of a properly reduced carbohydrate-mineral salts medium. Continuous transfer in a synthetic medium is said to depend on a factor synthesized by the growing organism which is ordinarily transferred in sufficient quantity in the inoculum to stimulate growth initiation. This factor was separated from *Rhizobium* cultures by ultrafiltration and was readily destroyed by heat. Either thiamin or flavin alone proved capable of replacing to some extent the stimulative factor synthesized by *R. trifolii*, but certain combinations of both vitamins were more active than either one alone. The organism synthesized appreciable quantities of both vitamin B_1 and riboflavin, and these vitamins were present in culture autolysates or filtrates as complexes which

were readily destroyed by heat, with resultant decreased activity. Further evidence is presented to indicate that the activity of the metabolic products of *R. trifolii* in stimulating growth initiation of the same organism is due, at least in part, to the presence of thiamin and flavin.

Host plant specificity among the Medicago in association with root-nodule bacteria, J. C. BURTON and P. W. WILSON. (Univ. Wis.). (*Soil Sci., 47 (1939), No. 4, pp. 293–303, pl. 1, figs. 2*).—Three *M. sativa* varieties (Ladak, Hairy Peruvian, and Grimm) were tested for nitrogen-fixing ability in association with nine strains of *Rhizobium meliloti* under differing environal conditions. Although there was definite evidence of host specificity, its occurrence tended to be erratic. The host-bacterial relationship was apparently affected by other factors (e. g., environal conditions) which obscured the specific host influence. Five *Medicago* species were also tested for nitrogen-fixing power in association with the same nine bacterial strains, and unequivocal host specificity was established among these species. On *M. sativa*, *M. lupulina*, and *M. minima* all bacterial strains were very efficient with one possible exception (strain 105 on *M. sativa*). In contrast, strain 105 only proved capable of fixing nitrogen in association with *M. arabica* and *M. hispida*.

Note on the successive dilution method for estimating bacterial populations, R. D. GORDON and C. E. ZOBELL (*Zentbl. Bakt. [etc.], 2 Abt., 99 (1938), No. 14–17, pp. 318–320, figs. 2*).—Experimental data from the literature are arranged graphically so as to corroborate the conclusion, arrived at on theoretical grounds by the senior author (E. S. R., 80, p. 20), that modal estimates of bacterial densities based on successive dilution procedure are unsatisfactory for bacteriological purposes. The geometrical mean is proposed as the correct (simple) estimate, for which formulas have been developed (loc. cit.).

Homothallism in Pythium, T. C. VANTERPOOL (*Mycologia, 31 (1939), No. 2, pp. 124–127*).—The complex condition in the thallism of certain species of *Phytophthora* and *Peronospora* is pointed out, strict homothallism is shown to exist in the five species of *Pythium* studied, and a method of obtaining single zoospore cultures of *Pythium* is detailed.

Embryo-sac development in Plumbagella, J. W. BOYES. (Univ. Wis.). (*Natl. Acad. Sci. Proc., 25 (1939), No. 3, pp. 141–145, figs. 9*).—A morphological and cytological study.

Some Venezuelan fungi [trans. title], R. A. TORO (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 22 (1938), No. 4, pp. 449–454, pl. 1*).—Various additions have been made since the publication in 1934 by Chardon and Thoro (E. S. R., 72, p. 460). "The present paper represents an attempt to identify some of the specimens which were collected in the course of the several trips to Venezuela," and includes *Schiffnerula paraparensis* n. sp. and *Kerniomyces costi* n. g. and sp.

A few new Zoöpagaceae destructive to large soil rhizopods, C. DRECHSLER. (U. S. D. A.). (*Mycologia, 31 (1939), No. 2, pp. 128–153, figs. 7*).—Four species of *Cochlonema* (two new) and *Acaulopage marantica* n. sp. are described and discussed. It is suggested that the feeding operations of this group of fungi may have an important relation to the pronounced fluctuations in populations of soil protozoa when determinations of their numbers are made from day to day.

The validity and morphology of two Tryblidiella species, R. K. VOORHEES. (Fla. Expt. Sta.). (*Mycologia, 31 (1939), No. 2, pp. 113–123, figs. 4*).—It is concluded that according to present ideas of classification *T. rufula* and *T. fusca* can be separated into two distinct species by the morphological characters of the ascocarps. There are 11 literature references.

Dissection and preparation of whole mounts of endosperm from the seeds of Grevillea (Proteaceae), S. B. KAUSIK (*Stain Technol., 14 (1939), No. 2, pp. 43–46, figs. 3*).—It is sometimes very desirable to supplement the examination of serially cut microtome sections by dissection and study of whole mounts of objects. The present note is intended to point out another instance where such study is needed and to outline a successful procedure.

A nile blue culture medium for lipolytic microorganisms, G. M. EISENBERG (*Stain Technol., 14 (1939), No. 2, pp. 63–67*).—The procedure outlined for enumerating lipolytic micro-organisms makes use of nile blue sulfate as a specific indicator for detecting changes in neutral fats. The medium is said to be equally efficient for either pour or streak plates.

Staining solutions included in the National Formulary, H. J. CONN (*Stain Technol., 14 (1939), No. 2, pp. 41, 42*).

Stains recently certified (*Stain Technol., 14 (1939), No. 2, p. 42*).—This is an annotated list.

A new sharpening back and procedure of sharpening for microtome knives, W. EVENDEN and C. E. SCHUSTER. (U. S. D. A.). (*Stain Technol., 14 (1939), No. 2, pp. 69–71, fig. 1*).—The advantages claimed for the new detachable knife sharpening back, here described and illustrated, are that it is exactly replaceable in one position and is immovable in use and has long-wearing qualities.

The preparation of hardened embedding paraffins having low melting points, H. C. WATERMAN (*Stain Technol., 14 (1939), No. 2, pp. 55–62*).—"Technical 'stearic acid' hardens paraffins melting at 52° C. and above, and at the same time lowers the melting point. Spermaceti wax further lowers the melting point of such a mixture without much effect on the hardness. With these two substances, and one of the anticrystallizing adjuvants already found satisfactory, embedding media yielding thin sections at room temperature and having melting point below 52° can easily be prepared. A general method is given, specific formulas are stated, and the behavior at various temperatures of typical embedding media of this kind is described."

Micellar concept [trans. title], A. FREY-WYSSLING (*Chron. Bot., 5 (1939), No. 1, pp. 9, 10, fig. 1*).—A presentation of the modified micellar theory of Nägeli proposed by the author which looks upon the micellae present in organized biological substances as bound together in a netlike structure by interconnecting molecular strands in a manner which conditions the infiltrability, stainability, and permeability, as well as the mechanical and optical properties of such substances. This conception is held to apply probably to the submicroscopic structure of protoplasm and its derivatives such as starch, cellulose, chitin, silk fibroin, keratin, collagen, muscle myosin, etc.

The microfibrillar and microcapillary structure of the cell wall, I. W. BAILEY (*Bul. Torrey Bot. Club, 66 (1939), No. 4, pp. 201–213, figs. 11*).—This is a critical, analytical review (14 references) of studies of cells of various tissues in a wide range of both angiosperms and gymnosperms.

Role of synaeresis in the mechanism of cell freezing [trans. title], P. BECQUEREL (*Chron. Bot., 5 (1939), No. 1, pp. 10, 11*).—A discussion of the probable relation of this well-known phenomenon of physical chemistry to the behavior of the cytoplasm and nucleus of living plant cells exposed to different degrees of low temperature. Tested at —190° to —25° C., plant tissues were never killed by plasmolysis, but the cold appeared to induce synaeresis in the colloidal systems of the cytoplasm, nucleus, and cell sap terminating in the formation, during death, of an irreversible coagulum composed of large colloid proteid micellae. The exudation of water which occurs on thawing is considered as

arising from the water of synaeresis, which easily escapes after the granular coagulation which destroys the semipermeability of the plasma membranes.

The morphology and embryogeny of Sequoia gigantea, J. T. Buchholz. (Univ. Ill.). (*Amer. Jour. Bot., 26 (1939), No. 2, pp. 93–101, figs. 31*).—A study of the morphological and cytological details of embryo development is discussed and illustrated.

The fate of the indigenous, A. N. Wilcox. (Minn. Expt. Sta.). (*Minn. Acad. Sci. Proc., 5 (1937), pp. 15–23*).—The author calls attention to some of the possibilities of a long-time, coordinated study from the ecological viewpoint of typical indigenous floras and faunas, describes an example of how such a study is being successfully conducted in England, and points out the exceptional opportunity in Minnesota. The need of preserving from further disturbance or extinction of relatively undisturbed natural areas for scientific observation is emphasized.

Some features of the vegetation of the Columbia River gorge with special reference to asymmetry in forest trees, D. B. Lawrence. (Univ. Minn.). (*Ecol. Monog., 9 (1939), No. 2, pp. 217–257, figs. 10*).—The author discusses the physical and general vegetational features of the gorge, the flood tolerance of living firs and pines above the Cascade rapids, and asymmetric crowns and their relation to wind and weather in the gorge (the asymmetric crowns, weather conditions of the gorge as related to fir crowns, and crown asymmetry in general and its relations to wind direction, velocity, and duration). The gorge appears to have acted as an east-west corridor for, and as a north-south barrier to, plant migration.

Autonomic cycle of rate of exudation of plants, K. A. Grossenbacher. (Univ. Calif.). (*Amer. Jour. Bot., 26 (1939), No. 2, pp. 107–109, figs. 5*).—A definite autonomic cycle of exudation from cut surfaces of stems of *Helianthus* cut off near the soil surface was found.

The role of potassium in plants.—I, Effect of varying amounts of potassium on nitrogenous, carbohydrate, and mineral metabolism in the tomato plant, M. E. Wall. (N. J. Expt. Stas.). (*Soil Sci., 47 (1939), No. 2, pp. 143–161, figs. 2*).—Potassium deficiency symptoms are discussed, and evidence is presented that environal conditions in relation to internal metabolic changes due to K deficiency are primarily responsible for the different deficiency symptoms that have been noted. Deficiency in K appears to curtail protein synthesis, and this seems to occur in the stage amino acid-protein after amino acids have been formed. Accumulation of nitrates and carbohydrates is explained on a partial mass action effect. The final decrease in carbohydrates in K-deficient plants is ascribed to the effects of a decrease in assimilation and an increase in respiration. Plants deficient in K showed an increase in the absorption of other ions, particularly phosphate. "Preliminary evidence is given of a low concentration of potassium which is not only an optimum supply but is also close to a minimum supply for tomatoes in sand culture under the experimental conditions. The possible bearing of the antagonism of calcium to potassium in relation to carbohydrate assimilation and growth is discussed. There are 29 references.

Base content of corn plants as influenced by pH of substrate and form of nitrogen supply, C. H. Wadleigh and J. W. Shive. (N. J. Expt. Stas.). (*Soil Sci., 47 (1939), No. 4, pp. 273–283*).—In corn plants grown in two types of nutrient solutions, each adjusted to six different pH values between 3 and 8, the total base content of all was relatively high as compared with the usual value for soil-grown plants. There was a direct correlation between high K content and the pH of the expressed sap. Plants from the solution containing nitrate and ammonium N in approximately equal proportions showed considerably lower

total base content and lower pH of the expressed sap than plants from the solution containing nitrate N only. It appears that absorption of the ammonium ion lowers the absorption rate of the other cations. Its presence had the most depressing effect on the absorption of Ca and the least on that of Mg. It was indicated that high K absorption has a depressing effect on that of Ca and Mg. The presence or absence of the ammonium ion had a much more marked effect on absorption and accumulation of bases than had the variation in pH levels. The results appear to indicate that the pH values of solution films adjacent to roots in contact with solutions containing both nitrate and ammonium N were considerably lower than those of corresponding films on roots in contact with solutions containing nitrate N only, regardless of the pH levels of the body of the solutions. It is suggested that this is partially responsible for the difference in base content in the two series of plants studied.

The necessity of some minor elements in the economy of plants and animals, J. S. McHargue. (Ky. Expt. Sta.). (*Ky. Acad. Sci. Trans., 7 (1935–37), pp. 38–52, figs. 12*).—In his "president's address," the author claims that the detail and careful precision required in the procedures described "possess some novel ideas, which are of fundamental importance in ascertaining the essential nature of the minor elements in the economy of both plants and animals; furthermore, that the very striking results which have been obtained on the growth of fungi, yeast, forage crops, and vegetables, by a close observance of the procedures described, contribute to a better understanding of the function of a number of the minor elements in the art and science of agriculture."

Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition, compiled by L. G. Willis (*New York: Chilean Nitrate Ed. Bur., Inc., 1939, 3. ed., pp. [3]+488*).—This edition of the bibliography contains 4,628 abstracts and references, which is 1,862 more than the second edition (E. S. R., 77, p. 599).

Physiology of ethylene production, use, and reactions in plants, R. C. Nelson. (Univ. Minn.). (*Minn. Acad. Sci. Proc., 6 (1938), pp. 37–41, figs. 2*).—This is a review, with bibliographic footnotes, leading to the conclusion that "in any case, it seems that ethylene is concerned with the respiratory processes, being produced by them and perhaps acting as a regulator of them. More than this cannot positively be said at the present."

The metabolism of amides in green plants.—II, The amides of the rhubarb leaf, H. B. Vickery, G. W. Pucher, C. S. Leavenworth, and A. J. Wakeman. (Conn. [New Haven] Expt. Sta. et al.). (*Jour. Biol. Chem., 125 (1938), No. 2, pp. 527–538*).—Continuing this series (E. S. R., 78, p. 465), rhubarb leaves were found to be far more acid than those of tobacco, and very considerable concentrations of ammonium ion may be normally present. An amide-synthesizing mechanism is present which responds when concentrations of the latter rise as a result of protein decomposition during culture of detached leaves. Glutamine was synthesized both in light and in darkness. Though the ability to produce glutamine from ammonia and some unknown carbon compound is certain, it is deemed quite possible that a substantial part of the newly formed glutamine may be directly derived from the protein. Theories of the mechanism and effects of glutamine synthesis are discussed. The general mechanism for ammonia production in plant tissues from deamination of amino acids of protein origin is considered applicable to rhubarb, and an approximately quantitative relationship in the nature of a balance sheet between the α-amino nitrogen and the products of its transformations can be drawn up. However, excess ammonia is said to be invariably found which indicates that minor amounts of nitrogen in form other than α-amino nitrogen may become involved in the

oxidation reactions. No positive evidence of the nature of the glutamine precursor was found. Synthesis occurred in parallel tests almost equally well in light and darkness, and thus does not depend on the presence of the immediate products of photosynthesis as in tobacco. Culture on glucose solution in the dark gave no marked increase in glutamine production, though there was evidence that the glucose entered the tissues and that ample ammonia was present. Glucose is thus probably neither the direct nor the indirect precursor of glutamine in rhubarb.

Physiological youth as an important factor in adaptive enzyme formation, C. P. Hegarty. (Cornell Univ.). (*Jour. Bact., 37 (1939), No. 2, pp. 145–152, figs. 2*).—Using *Streptococcus lactis* as test organism, the most rapid adaptation to new sugars occurred with cells from cultures just coming out of the lag phase, during the period of physiological youth. During the logarithmic phase, adaptability decreased rapidly and continuously. During aging of a culture, the ease of adaptation and the rate of loss of adaptability varied greatly with each sugar.

Cation interchange between plant roots and soil colloids, H. Jenny and R. Overstreet. (Univ. Calif.). (*Soil Sci., 47 (1939), No. 4, pp. 257–272, figs. 4*).—"Low salt barley roots tenaciously retain their potassium against distilled water over a period of at least 10 hr. Salt solutions of moderate concentrations do not appreciably influence the potassium level of the roots investigated. Dilute clay suspensions carrying adsorbed Na, NH_4, or H ions pull out potassium from normal low salt roots. During the brief interval of 10 hr., the potassium level of the root may be reduced 15 to 90 percent, depending on clay concentration, particle size, and the nature of the adsorbed cation. Ca-bentonites, in the concentrations used, do not greatly affect the potassium status of the roots. If the roots and the clay particles are separated by a semipermeable membrane, the aforementioned effects are not observed. The effects are also absent if positive iron hydroxide sols are substituted for the negative clay sols. It is concluded that these experiments reveal the existence of a contact phenomenon between plant roots and clay particles. A theory of contact exchange is proposed according to which cations may transfer from clay to root and vice versa without entering the soil solution."

The effect of the composition of the medium upon the growth of yeast in the presence of bios preparations.—II, The response of several strains of Saccharomyces cerevisiae, J. B. Lesh, L. A. Underkofler, and E. I. Fulmer. (Iowa State Col.). (*Jour. Amer. Chem. Soc., 60 (1938), No. 10, pp. 2505–2507*).—Data were previously presented[1] indicating that for the one strain of yeast used the presence of $MgSO_4$ markedly increased its growth in the presence of bios II or a mixture of bios II and bios I (*i*-inositol). The present paper reports the effects of bios II, bios I, and $MgSO_4$ alone and in combinations on the growth of 13 strains of *S. cerevisiae*. On the basis of the marked differences in response to the different media these strains were separated into three distinct groups.

Effect of phytohormone dusts on growth and yield of winter wheat varieties, G. P. McRostie, J. W. Hopkins, and N. H. Grace (*Canad. Jour. Res., 16 (1938), No. 12, Sect. C, pp. 510–515*).—Indolylacetic and naphthylacetic acids in various concentrations were applied to 10 varieties of winter wheat before planting in a replicated field test, half of each plat receiving seed treated with Ceresan and hormone and the other half with Ceresan only. Some differences were visually apparent between the plats with and without hormone, and there

[1] Jour. Amer. Chem. Soc., 58 (1936), No. 8, pp. 1356–1358.

were also statistically significant increases in straw production, and in yield and weight per bushel of the grain. However, the effects on grain yield were complicated by the differential response of varieties to the same treatment, at the higher dosages there being some depressions in yield. Both chemicals tended to reduce slightly the average nitrogen content of the grain. As a whole, the results appear to demonstrate the physiological activity of both hormones when applied in this way.

Potentially unlimited growth of excised plant callus in an artificial nutrient, P. R. White (*Amer. Jour. Bot., 26 (1939), No. 2, pp. 59–64, figs. 13*).—This growth was obtained on sterile 0.5 percent agar with a Uspenski solution, 2 percent sucrose and 0.01 percent of an extract of dried brewers' yeast. Tobacco, tomato, and beet tissues are reported to have been propagated in a similar manner to the *Nicotiana glauca* ×*N. langsdorffii* stele tissue used in the experiments here described (E. S. R., 72, p. 185).

Growth of excised tomato roots in a synthetic solution, W. J. Robbins and M. B. Schmidt (*Bul. Torrey Bot. Club, 66 (1939), No. 4, pp. 193–200, figs. 2*).—In continuation of studies of excised tomato roots (E. S. R., 80, p. 26), one of the interesting but unexpected observations from the data here presented was that growth in the solutions supplemented with thiazole was generally superior to that in solutions supplemented with thiamin. With a considerable excess of thiamin, as occurred in the solutions in these tests, possibly sufficient pyrimidine was present to be injurious. The results led to the conclusion that amino acids are not essential for growth of these excised roots, as the sole source of nitrogen was in the form of nitrates. Although unlimited growth of this strain of tomato roots appeared possible in a solution of minerals and sugar, supplemented either with thiamin or thiazole, there is the possibility that the cane sugar used, in spite of its high purity, contained traces of another growth substance. It is not to be concluded from the results presented that excised roots of other kinds of plants must be supplied with thiamin or thiazole and vitamin B_6 for successful growth in liquid cultures, but it is necessary to understand the requirements of one root in order that the results may be intelligently applied to others.

Effect of some synthetic growth substances on root development of transplanted trees, P. E. Tilford. (Ohio Expt. Sta.). (*Natl. Shade Tree Conf. Proc., 14 (1938), pp. 51–59, figs. 2*).—Treatments at time of transplanting with some synthetic substances (indolebutyric, indoleacetic, indolepropionic, and phenylacetic acids) stimulated new root development on certain kinds of trees, the first named proving most effective of the four. Although no very practical method of using this material effectively on large trees can as yet be suggested, it is hoped that such can be developed.

Some experiments on bud growth, F. W. Went (*Amer. Jour. Bot., 26 (1939), No. 2, pp. 109–117, figs. 5*).—In tests with etiolated pea shoots the increasing inhibition with increase of distance between inhibited lateral bud and inhibiting agent was confirmed with indoleacetic acid applied at different distances from the bud, and the inhibiting effects of some nonauxins and substances with low growth activity are described. The results indicated that indoleacetic and γ phenylbutyric acids cause an accumulation of bud growth factors just below their point of application and that they do not inhibit growth by themselves. It is claimed that the inhibition is a secondary effect of the applied auxin. Some cases of inhibition of the apical bud by lateral buds are also described, and it is shown that bud inhibition can be induced in roots which regenerate buds on their basal cut surfaces in much the same way as in stems.

Cytogenetic results with colchicine, M. L. Ruttle and B. R. Nebel (N. Y. State Expt. Sta.). (*Biol. Zentbl., 59 (1939), No. 1-2, pp. 79-87, figs. 3*).—This is a review and progress report presenting data illustrative of the present status of a breeding program carried out by the senior author to demonstrate that colchicine is practically important to plant breeders willing to use cytogenetic methods. There are 14 literature references.

Observations on the immediate effects of colchicine, J. G. O'Mara. (U. S. D. A. and Mo. Expt. Sta.). (*Jour. Heredity, 30 (1939), No. 2, pp. 35-37, pl. 1*).—"Observations on the effects of colchicine treatments for different periods and concentrations are recorded. The hypertrophy usually associated with treatment was found not to involve the meristem but the region of elongation. The colchicine-affected chromosomes are more accurately measurable than ordinary somatic chromosomes—this may indicate that the drug can be profitably used in studies of chromosome morphology in somatic tissues."

The newest fad, colchicine, and its origin, S. J. Wellensiek (*Chron. Bot. 5 (1939), No. 1, pp. 15-17*).—A brief digest of the development of knowledge about the properties and effects of colchicine and its use to induce polyploidy.

Thiamin and plant growth, W. J. Robbins (*Science, 89 (1939), No. 2310, pp. 303-307*).—Studies by the author and his associates lead him to conclude that growth substances are important for plants as well as for animals, and that one of the most important for plants is thiamin, all or almost all of them apparently requiring it. It was demonstrated that some of the fungi studied which required no external supply of thiamin synthesized it, and it is deemed justifiable to assume that the others in this group also have the same power. The green plant is thus not the sole source of this vitamin. Depending on the organism concerned, thiamin may be considered a hormone, a vitamin, or something which is neither. The author therefore for the present prefers the term "growth substance" for any specific organic substance needed in small amounts for normal development of a living organism. Thiamin plays a significant role in carbohydrate metabolism and probably also in other metabolic processes. At least one of its functions is apparently to serve as a precursor of a part of an enzyme system involved in respiration, but probably this is not its sole function. It is believed that it has a multiple function as a coenzyme in nature. It is suggested that *Phycomyces* might be used advantageously in determining more completely the changes occurring in the intermediary metabolism of carbohydrates and in the quantitative determination of thiamin. Studies of this fungus, as well as of tomato and pea roots and staphylococci, have indicated thiamin to be quite specific, and this specificity is doubtless associated in part with its function as a precursor of a part of an enzyme system. Observations on growth in mixed cultures have proved most suggestive from the standpoints of parasitism and symbiosis, and attention is called to the promise in the plant-thiamin relationship of elucidating important questions in general physiology through the study of more easily controlled material than the higher animal. However, the point is stressed that thiamin is not the only growth substance concerned in plant development, and the functions of several others are briefly noted. Finally, it is emphasized that the physiological mechanisms of fundamental processes are much the same in all living organisms, although details differ.

A comparison of two quantitative Avena techniques in the determination of 3-indole acetic acid, R. H. Goodwin (*Amer. Jour. Bot., 26 (1939), No. 2, pp. 74-78, fig. 1*).—The method of Went with water-cultured and that of Boysen Jensen with soil-cultured plants each has certain advantages, as tested by the author. In a laboratory with no facilities for exact control of humidity in the

constant-temperature dark room, the second method may be most simply, accurately, and expeditiously used. In a completely air-conditioned dark room, however, the Went method is said to be more speedily executed and more readily standardized and modified. The relative accuracy of the two methods under such conditions was not investigated.

Control of crop nutrition by the method of foliar diagnosis, W. THOMAS and W. B. MACK (*Pennsylvania Sta. Bul. 378 (1939), pp. 33, figs. 7*).—The experimental foundation on which the foliar diagnosis method is based is outlined, certain concepts inherent in it are described, and the method is evaluated in relation to other procedures for soil and plant testing. Results of the use of this method are presented with corn on 13 differently fertilized field plats, and the interpretation of the data is shown by two methods of graphic analysis. The effects of the various fertilizers on the nutrition of the plants of each plat as indicated by differences in the intensities and compositions of the NPK units with advancing age of the leaf are compared. The relative effects of the different fertilizers on yields are the resultant of factors acting during growth, and are readily shown by a magnitude representing the mean values of the intensities of the NPK units, respectively, during the growth cycle. Applications of the method to the determination of suitable experimental sites for field plats, to the selection of a properly balanced fertilizer, to the diagnosis of pathological conditions associated with nutritional disturbances, and to plant breeding programs are described.

Plant injection, D. AKENHEAD (*Chron. Bot., 5 (1939), No. 1, pp. 31, 32*).—A review of the contribution by Roach (E. S. R., 80, p. 496), with special reference to rapid diagnosis of mineral deficiencies.

Behavior of sugarcane to length of day, G. B. SARTORIS. (U. S. D. A.). (*Internatl. Soc. Sugar Cane Technol. Cong. [Baton Rouge, La.] Rpts., 6 (1938), pp. 59, 60*).—An abstract.

GENETICS

Abstracts of papers presented at the 1938 meetings of the Genetics Society of America (*Genetics, 24 (1939), No. 1, pp. 65, 66, 77, 84, 85, 86, 95, 102, 103, 109, 110*).—The following papers of botanical interest are included: Sectorial Chimeras, Chromosome Deficiencies and Doubling of Chromosome Number in *Datura stramonium* Induced by Colchicine Treatment, by A. D. Bergner, A. G. Avery, and A. F. Blakeslee; Characteristics of Induced Polyploids in Different Species of Angiosperms, by A. F. Blakeslee, H. E. Warmke, and A. G. Avery; Growth Changes Associated With Chromosome Breakage and Reattachment, by D. F. Jones (Conn. [New Haven] Expt. Sta.); The Effect of Colchicine-Induced Polyploidy on Fruit Shape in Cucurbits, by E. W. Sinnott, A. F. Blakeslee, and H. E. Warmke; Induction of Polyploidy in *Nicotiana* Species and Species Hybrids by Treatment With Colchicine, by H. H. Smith (U. S. D. A.); Induction of Diploids From Haploids by Colchicine Treatment, by A. F. Blakeslee and A. G. Avery; Physiological Factors Involved in Differentiation of Male and Female Parts of the Angiosperm Flower, by W. F. Loehwing; and Induction of Tetraploidy in *Nicotiana sanderae* and in the Sterile Hybrid *N. tabacum* × *N. glutinosa* by Colchicine Treatment, by H. E. Warmke and A. F. Blakeslee.

Genetics in the U. S. S. R., N. I. VAVILOV (*Chron. Bot., 5 (1939), No. 1, pp. 14, 15*).—A survey of the chief contributions presented at the February 1938 Moskva conference on interspecific and intergeneric hybridization and of the November 1938 Moskva conference on the use of physical and chemical methods of obtaining polyploids and amphidiploids.

Relationships in the genus Gossypium as indicated by cytological data, J. M. WEBBER. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 4, pp. 237–261*).—The meiotic chromosome conjugation is reported of F_1 of 23 new interspecific hybrids, including 12 different types of hybrids; F_2 of certain 13- × 13-chromosome combinations; and F_2 and F_3 of certain 13- × 26-chromosome combinations. The conjugation observed, in conjunction with that previously reported, supports the grouping of the species as follows: The Australian species, *G. sturtii*; Asiatic species; wild American species; and cultivated American species. Relationships of species within and between these groups are discussed. Evidence for and against the various hypotheses of the origin of 13-chromosome species and of purely American origin of cultivated American cottons is given, and cytogenetic literature bearing critically on the relationships of species in *Gossypium* is reviewed and summarized in table form. See also an earlier note (E. S. R., 77, p. 34).

Cytogenetic observations in Lactuca, T. W. WHITAKER and I. C. JAGGER. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 4, pp. 297–306, figs. 3*).—The following species of *Lactuca* were studied cytologically and reciprocal crosses among them attempted: *L. sativa, L. scariola, L. chondrillaeflora, L. perennis, L. tartarica, L. cretica, L. bourgaei, L. graminifolia,* and *L. canadensis*. Among the eight- and nine-chromosome species there were marked differences in the chromosome ideograms. The greatest degree of differentiation in chromosome morphology was observed in *L. sativa*. Normal pollen varied from 80 to 85 percent in some species to 90 to 95 percent in others. All except *L. perennis* were self-fertile. Fertile hybrids were obtained only between *L. sativa* × *L. scariola* and *L. canadensis* × *L. graminifolia*. No cytological irregularities were observed in the F_1 or F_2. Irregularities during meiosis apparently reduced pollen fertility to from 80 to 85 percent in *L. bourgaei*, an eight-chromosome species.

Artificial induction of polyploidy in alfalfa, D. C. COOPER. (Wis. Expt. Sta.). (*Amer. Jour. Bot.*, *26* (*1939*), *No. 2, pp. 65–67, figs. 2*).—Among racemes of tripped flowers of alfalfa (*Medicago sativa*) subjected to heat treatment early in proembryo development, one tetraploid individual ($2n=64$) was obtained from a population treated at 42° C. at 47–48 hr. after pollination. The tetraploid plant is described as similar to diploids in general habit, but possessed of somewhat stouter stems and larger leaves and flowers. The stomata, epidermal cells, and pollen grains were appreciably larger than in the diploid. The quadrivalents present at diakinesis in the microsporogenesis of the tetraploid varied from three to six. Lagging chromosomes were present on both the heterotypic and homeotypic spindles. The induced tetraploid was highly sterile. Three offspring are reported from seeds resulting from self-pollination, all of which are tetraploid.

Heritable variations conditioned by euploid chromosome alterations, D. KOSTOFF (*Chron. Bot.*, *5* (*1939*), *No. 1, pp. 17–19*).—Reasons are given why it appears desirable for investigators who attempt to produce polyploids for practical purposes (especially with colchicine and acenaphthene) to restrict their work chiefly to plants with small chromosome numbers and with short chromosomes.

Amphidiploids in the Triticinae induced by colchicine, E. R. SEARS. (U. S. D. A. and Mo. Expt. Sta.). (*Jour. Heredity*, *30* (*1939*), *No. 2, pp. 38–43, figs. 4*).—Amphidiploid sectors, involving up to one-third of the plant, occurred in sterile hybrids of *Triticum monococcum* × *Aegilops uniaristata*, *A. caudata* × *A. umbellulata*, and *A. speltoides* × *A. umbellulata* as a result of colchicine treatments administered to the hybrid seedlings. These sectors were male and

female fertile, the height of pollen fertility of the different amphidiploids varying inversely with the degree of pairing in the corresponding diploid hybrids. Little or no morphological difference was found between $2n$ and $4n$ tillers of the same plant, and *T. monococcum* × *A. uniaristata* even failed to show a difference in stomatal size or distribution. It is reported also that W. M. Myers, working at State College, Pa., has induced with colchicine a number of tetraploids of *Lolium perenne*.

Inheritance of new sex forms in Cucumis melo L., C. F. POOLE and P. C. GRIMBALL. (U. S. D. A.). (*Jour. Heredity, 30 (1939), No. 1, pp. 21–25, fig. 1*).—Following the discovery among Chinese melon introductions of a form with all-perfect flowers, crosses were made between this plant and monoecious and andromonoecious varieties. An examination of the progeny in the F_1 and F_2 generations indicated that the hermaphrodite is genetically double recessive to monoecious. Segregation in the F_2 of the monoecious × hermaphrodite approximated the phenotypic ratio of 9 monoecious : 3 andromonoecious : 3 gynomonoecious : 1 hermaphrodite. The F_2 of the andromonoecious × hermaphrodite approximated the expected 3 : 1 ratio.

Inheritance of immunity from virus X (latent mosaic) in the potato, F. J. STEVENSON, E. S. SCHULTZ, and C. F. CLARK. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 4, pp. 362–365*).—In graft tests U. S. D. A. seedling 41956 proved immune to at least six strains of this virus. The inheritance of this immunity was studied in crosses of S 41956 with two nonimmune varieties, and in progenies of S 41956 and two other immunes selfed. Of the F_1 of the two crosses 37 percent and of the selfed lines 72–78 percent proved immune. These results can be explained by the usual type of inheritance in autotetraploids. The hypothesis is presented that with the genes *A* and *B* both necessary for immunity, the immunes used as parents in this study had the genetic constitution *AA aa Bb bb* and the nonimmunes *aa aa bb bb*.

[**Papers on animal genetics presented before the Genetics Society of America at the 1938 meetings in Richmond, Va., Ottawa, Canada, and Woods Hole, Mass.**] (*Genetics, 24 (1939), No. 1, pp. 67, 69, 70, 72, 74, 75, 76, 79, 90, 91, 92, 93, 94, 98, 99, 102, 111; also in Genet. Soc. Amer. Rec., 7 (1938), pp. 67, 69, 70, 72, 74, 75, 76, 79, 90, 91, 92, 93, 94, 98, 99, 102, 111*).—Brief abstracts are presented on the following articles: Dominance in the *E* Series of the Guinea Pig, by H. B. Chase; Not by Genes Alone, by W. F. Dove (Univ. Maine); Linkage in Rats Between Factors Determining a Pathological Condition and a Coat Color, by W. F. Dunning and M. R. Curtis; A Genetic Study of Milk Goats, With Especial Regard to the Occurrence of Hermaphroditism, by O. N. Eaton and V. L. Simmons (U. S. D. A.); The Effect of Ultraviolet Radiation on the Color Pattern of Phenotypes of the Goldfish *Carassius auratus*, by H. B. Goodrich and J. P. Trinkaus; Breeding Small Flocks of Domestic Fowl for High Fecundity, by F. A. Hays (Mass. State Col.); Inheritance in Rat Caries, by H. R. Hunt and C. A. Hoppert (Mich. State Col.); "Legless"—a New Lethal in Swine, by L. E. Johnson and J. L. Lush (Iowa State Col.); Effect of Inbreeding and Selection on the Frequency of Prostates in Female Rats, by E. Witschi and G. M. Riley; Chromosome Behavior in Relation to Cancer Susceptibility in Mice, by A. Howard; Induced Lateral Size Asymmetry in the Fowl, by S. S. Munro; Determination of Hair Pigments in the Mouse, by S. C. Reed (E. S. R., 80, p. 751); A Study of Individual Versus Group Needs as a Theoretical and an Experimental Approach to Aggridascendance, by W. F. Dove (Univ. Maine); A Study of Pigmentation in the Chick Embryo by Means of Limb Bud Transplantation, by H. L. Eastlick (Univ. Mo.); Types of Cross-Beak in Fowl, by W.

Landauer ([Conn.] Storrs Expt. Sta.); and A New Dwarf Mutation (dw_2) in *Rattus norvegicus*, by G. W. Woolley and L. J. Cole (Univ. Wis. et al.).

Genetics and live-stock production, F. W. Dry (*New Zeal. Dept. Sci. and Indus. Res. Bul. 64 (1938), pp. 88, figs. 47*).—An account of the principles and application of genetics to livestock production.

Variations in the spotting character of "pinto" horses, J. B. Hill. (Pa. State Col.). (*Pa. Acad. Sci. Proc., 12 (1938), pp. 33–35, fig. 1*).—Contradictory evidence regarding the recessive nature of glass eye, as well as its association with the recessive spotting character, is indicated in two cases of dominant spotting associated with the glass-eye condition.

[**The production of tailless sheep at the South Dakota Station**] (*South Dakota Sta. Rpt. 1938, pp. 16, 17*).—Of 64 lambs born in 1938, none required docking. Ten of the 13 crossbred lambs of no-tail × Southdown grade parents had tails averaging 3.1 in., and 2 had no tails at all.

Weights and measurements of the parts and organs of mature inbred and crossbred guinea pigs, O. N. Eaton. (U. S. D. A.). (*Amer. Jour. Anat., 63 (1938), No. 2, pp. 273–295*).—Study of the weights and measurements of organs of mature inbred and crossbred guinea pigs showed that some organs, such as the lungs and liver, are directly proportional to live weight, whereas others, such as the heart, spleen, kidneys, adrenals, and testicles, are nearly uniform in weight regardless of the live weights of the animals. The variability in the weights of organs was reduced by determining the ratio to live weight. Some organs from certain families and crosses had characteristic shapes and variability or anatomical peculiarities. In general, ♀♀ had lighter organs than ♂♂, except for the spleen, kidneys, and thyroid. The length of intestines and spleen showed the least variability and little relation to live weight.

The relation of albinism to body size in mice, W. E. Castle. (Univ. Calif.). (*Genetics, 23 (1938), No. 3, pp. 269–274*).—Continuing studies of the relation of color genes to size in mice (E. S. R., 76, p. 463), studies of the maximum weight, tail length, and body length at 6 mo. of age of cinnamon, brown, and albino mice segregated from the backcross of cinnamon (*AabbCc*) ♀♀ to albino (aabbcc) ♂♂ showed no significant differences in size that could be correlated with the three phenotypes. The albinism and nonagouti genes and their allels are concluded to be unrelated to body size. Correlations of 0.55 ± 0.01 and 0.26 ± 0.02 between weight and body length and between body length and tail length, respectively, were noted among more than 600 ♂♂ measured.

Selection for tail-spotting in the house mouse, E. F. Barrows (*Jour. Expt. Zool., 80 (1939), No. 1, pp. 107–111, fig. 1*).—Beginning with mice showing some tail spotting, 10 generations of selection for white spotting on the tail produced mice almost all of which showed white spotting on the distal end of the tails.

The induction by irradiation with neutrons of hereditary changes in mice, G. D. Snell (*Natl. Acad. Sci. Proc., 25 (1939), No. 1, pp. 11–14*).—Study of 44 F_1 animals in the irradiation experiments with neutrons (E. S. R., 74, p. 474) showed that there were produced 3 sterile and 3 semisterile ♂♂ and 1 semisterile ♀. No visible recessive mutations were observed.

A new ear defect in pigs: An apparent lethal factor, H. E. Annett (*Jour. Heredity, 29 (1938), No. 12, pp. 469, 470, figs. 2*).—The occurrence of lobed-eared pigs in two litters of Tamworths from related parents is noted. Some of the affected pigs had cleft palates and defective hind legs.

Hereditary brachydactylia and allied abnormalities in the rabbit, H. S. N. Greene and J. A. Saxton, Jr. (*Jour. Expt. Med., 69 (1939), No. 2, pp. 301–314, pls. 3*).—Deformities involving a shortening or absence of the component parts of the feet which were associated with abnormalities of the ear occurred in the progeny of a purebred English doe and a hybrid buck and in descendants of the first deformed animal. In the F_2 and backcross generations of over 200 progeny each, foot abnormality was found to behave as a simple recessive autosomal character. The occurrence of the defective ears was limited to animals with deformed feet, but the condition occurred in only 27 of 238 backcross progeny. The foot and ear abnormalities were either due to closely linked factors or additional expressions of the same gene. Embryological and histological studies showing that both types of deformities originated in hemorrhage and necrosis of the affected parts, followed by sloughing which was complete at the twenty-fifth day of gestation, favored the single gene explanation.

Inheritance of eggshell thickness in White Leghorn pullets, L. W. Taylor and I. M. Lerner. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 5, pp. 383–396, fig. 1*).—Starting in 1932 with a selection of hens producing thin- and thick-shelled eggs, respectively, and subsequently mating these with closely related males, two lines of chickens producing significantly different types of eggshells have been established. Continued selection of this type has been ineffective in further differentiation of the two lines or in decreasing the variability of expression of eggshell characters in subsequent generations. Apparently heritable factors were involved in the determination of the amount, thickness, and percentage of eggshell characteristics of individual hens, with evidence that dams have relatively greater influence than sires in determining shell character produced by daughters. Little or no decrease in shell percentage from clutch positions 1 to 2 occurred among females of the thick-shelled line, whereas pullets of the thin-shelled line tended toward a lower shell percentage in the eggs in position 2. Individual variations in this respect occurred in both lines. The percentage of total egg weight represented by eggshell was found to be a satisfactory expression of this character.

Notes on cross-beak in fowl, W. Landauer. ([Conn.] Storrs Expt. Sta.). (*Jour. Genet., 37 (1938), No. 1, pp. 51–68, pl. 1*).—Four types of cross beak in fowls are noted. One type was associated with eye defects; one occurred in homozygous creepers; and two types, one present at hatching and on developing later, were hereditary and had a complex mode of inheritance. Cross beak was not a true lethal, but mortality was heavy after hatching. Crossing of the upper beak toward one side or the other seemed more frequent in certain types, but the breeding data did not bear out its hereditary nature. A fifth type of cross beak involving a short but straight upper beak at hatching which later became crossed was also noted.

Estimating the influence of heredity on the tarso-metatarsal length of the domestic turkey, R. G. Jaap. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc. [Okla. Univ.], 18 (1938), pp. 11–13*).—The tarsometatarsal length in 511 ♂ turkeys ranged from 6.8 to 8.4 in. and in 508 ♀♀ from 5.2 to 6.5 in. in length. The analysis of variance in the shank length indicated that heredity was responsible for about 25 percent of the variability in ♂♂ and 39 percent of that in ♀♀. The ♀ shank length, therefore, serves as a better measure of breeding progress than that of ♂♂.

Investigation of the blood value of the Yaroslav breed of cattle with reference to productivity, H. F. Kushner (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 20 (1938), No. 5, pp. 393–397*).—The oxidative capacity of the blood of 270 Yaroslav cattle of different ages, sires, and stages of health

and reproduction was ascertained by methods to which attention was previously called (E. S. R., 80, p. 472). Variations with age and sex were noted. The hemoglobin value was relatively high in aged bulls and in young ♀ calves and pregnant and tubercular cows. Weight and the higher blood values seemed to be correlated. An index of the functional capacity of the blood was calculated for several breeds.

A preliminary note on the study of oestrus in sheep—dioestrous cycle in Bikaner ewes, L. W. SMITH and G. SINGH (*Agr. and Livestock in India, 8 (1938), No. 6, pp. 683–688*).—Intervals between services of Bikaner ewes not followed by pregnancies varied from 15 to 19 days. The duration of heat extended to over 24 hr. in some cases.

On the relative roles of increased and constant periods of illumination in the sexual photoperiodic activation of the male starling, J. W. BURGER (*Jour. Expt. Zool., 80 (1939), No. 2, pp. 249–257, pl. 1*).—Groups of starlings and juncos under limited light conditions failed to show spermatogenesis unless the days were systematically increased in length above 9 hr. A constant day length of 10.25 hr. would not continue spermatogenesis even though formation of spermatocytes had started.

Mammary activity, H. D. KAY (*Sci. Prog. [London], 33 (1939), No. 131, pp. 476–492*).—A review is given of the interaction of various hormones from the ovaries and pituitaries which are related to lactation, including especially oestrone and progesterone, in causing development of the mammary gland and prolactin in relation to the secretion of milk. The probable role of other hormones from these and other glands and their relationship to the precursors of milk are discussed.

The mammary gland of the rhesus monkey under normal and experimental conditions, S. J. FOLLEY, A. N. GUTHKELCH, and S. ZUCKERMAN (*Roy. Soc. [London], Proc., Ser. B, 126 (1939), No. 845, pp. 469–491, pls. 5, figs. 13*).—Description is given of the growth, development, and histological changes in the mammary gland of the rhesus monkey and its response to oestrone. Duct proliferation was stimulated in ♂♂ and ♀♀ by oestrone and testosterone propionate administration.

Chemical concentration of mammogen from prehypophyseal tissue, A. A. LEWIS and C. W. TURNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 3, pp. 435, 436*).—Preliminary studies gave evidence that mammogen had distinctly different chemical properties from lactogenic or carbohydrate-metabolism hormones contained in the pituitary gland. Mammogen could be extracted from pituitary tissue by lipid solvents and remained in solution at high concentrations of alcohol. It could be recovered as an oily residue upon the vacuum distillation of the alcohol or ether-alcohol extracting solutions.

Duration of sensitivity of the endometrium during lactation in the rat, R. A. LYON and W. M. ALLEN (*Amer. Jour. Physiol., 122 (1938), No. 3, pp. 624–626*).—Endometrial sensitivity, as measured by the production of deciduomata following injury to the endometrium in rats, was not present until 4 days after parturition. The sensitivity lasted only until the sixteenth day even though suckling and lactation were continued.

The physiology of development of feathers, I, II, F. R. LILLIE and M. JUHN (*Physiol. Zool., 5 (1932), No. 1, pp. 124–184, pls. 8, figs. 30; 11 (1938), No. 4, pp. 434–450, pls. 12, figs. 2*).—These papers deal with the fundamentals of the physiology, development, and growth of feathers. Part 1 deals with the Growth Rate and Pattern in the Individual Feather and part 2 with the General Principles of Development With Special Reference to the After-Feather.

Differential gradient functions in the feather germ, R. M. FRAPS (*Physiol. Zool., 11 (1938), No. 2, pp. 187–201, figs. 8*).—"Three orders of pigmentation induced in feathers of the Brown Leghorn male or capon with increasing hormone concentration are described. These are, in terms of loci in the collar of the developing germ, (a) the dorsoventral order previously described in detail by Lillie and Juhn [as noted above]; (b) the ventrodorsal order, which is completely the reverse of (a); and (c) a complex order, proceeding from a medial point in the collar toward both ventral and dorsal collar limits. These orders of pigmentation are interpreted in terms of differential gradient functions, that is, in terms of secondary gradients in the limiting reaction potentials for alternative pigmentation processes. Each of these secondary gradients, or gradient functions, is assumed to vary by differing proportionalities with a given change in primary gradient differentials, which are assumed to remain always the same in direction although varying in absolute values in collar limbs of different germs."

Longer range paternity in sheep, R. W. PHILLIPS, R. G. SCHOTT, and E. M. GILDOW. (U. S. D. A. and Idaho Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 12, pp. 471–474, figs. 3*).—Continuing studies on the artificial insemination of sheep (E. S. R., 79, p. 35), ram semen was transported from Beltsville, Md., to Moscow, Idaho. From 60 inseminations, 37 of which were from 31.5 to 72 hr. old, there were 5 pregnancies. An attempt was made to cool the semen slowly and maintain a temperature of 5° C. during transport.

Selective fertilization in poultry, G. BONNIER and S. TRULSSON (*Hereditas, 25 (1939), No. 1, pp. 65–76*).—Two lots of 5 Rhode Island Red ♀♀ each were inseminated with sperm from Rhode Island Red and White Leghorn ♂♂ on alternate days. There were produced 151 red chicks and 54 white chicks. Inseminations with mixed sperm from both breeds showed that 24 eggs were fertilized by White Leghorn sperm and 88 eggs by Rhode Island Red sperm. The results with the use of semen from the 2 breeds on alternate days showed that the highest frequency of fertilization was for eggs laid 2 days after insemination. Although simple microscopic examination indicated that the sperm from the 2 cocks were equally viable, when only the White Leghorn ♂ was used some hens produced only infertile eggs and others infertile eggs and white chicks. From the conclusions it was impossible to determine whether the individual ♂♂ showed selective fertility with the different ♀♀ or whether racial differences were exhibited.

The sex ratio in wild birds, E. MAYR (*Amer. Nat., 73 (1939), No. 745, pp. 156–179*).—A summary is given of data on the sex ratio of different species of wild birds. The adult sex ratios show extreme variations from equality in monogamous, polygamous, and polyandrous species which were, in part, correlated with peculiarities of the life history of each species.

Gonad-stimulating abilities of male and female rat pituitary glands, A. A. HELLBAUM and R. O. GREEP (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 902–904*).—Injections of acetone dried powder of pituitaries from ♂ rats into immature normal and hypophysectomized ♀♀ induced follicular growth in the ovaries without luteinization, except in a few cases when large doses were administered. Pituitaries from ♀♀ caused luteinization at all dose levels tested.

Visual pathways concerned in gonadal stimulation in ferrets, W. E. LEG. CLARK, T. MCKEOWN, and S. ZUCKERMAN (*Roy. Soc. [London], Proc., Ser. B, 126 (1939), No. 845, pp. 449–468, pls. 2, figs. 3*).—Lesions were made at various levels in the visual pathways of the brains of ♀ ferrets during anoestrus, and study was made of the influence of artificial light in bringing about heat in

these animals. Severing the optic nerves either prevented or delayed the onset of heat as compared with controls. "The experiments showed that the normal response to visual stimulation occurs in the absence of the superior colliculi, when all retinal impulses to any part of the midbrain have been interrupted, and when retinal impulses to the dorsal nucleus of the lateral geniculate body and the visual cortex have been completely interrupted."

Influence of diet on gonad activity of English sparrow, Passer domesticus (Linnaeus), J. C. Perry (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 716–719*).—Development in the testes and ovaries of English sparrows and darkening of the beaks of ♂♂ were induced during the nonbreeding season by feeding wheat exposed for over 250 hr. to ultraviolet irradiation. The induced spermatogenesis and increased size of the ovaries were similar to that resulting from direct irradiation of the birds.

The chemistry and biological significance of the male sex hormones, F. C. Koch (*Jour. Urol., 41 (1939), No. 2, pp. 199–205, figs. 2*).—The chemical composition of androgenic substances from different sources is given. Variations in the androgenic and oestrogenic substances in the urine of normal, castrate, and sex-deficient men and women are presented.

Maintenance of spermatogenesis in hypophysectomized mice with androgenic substances, W. O. Nelson and C. E. Merckel (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 737–740, figs. 3*).—Continuing studies of the practicability of maintaining spermatogenesis in hypophysectomized rats (E. S. R., 78, p. 323), the authors conducted similar studies on mice with much the same results. Crystalline androgens prevented the marked degenerative changes in the seminiferous tubules of hypophysectomized rats for at least 23 days. Androstanedione was the most effective of the substances tested.

Variations in the reaction of chicks to different methods of administering androgens, W. R. Breneman (*Endocrinology, 24 (1939), No. 1, pp. 55–62*).—Studies were made of the comparative comb-growth effects induced in capons by different methods of administering Oreton (testosterone propionate) and Oreton-B (dihydroandrosterone benzoate). Both substances were more effective by subcutaneous than by intraperitoneal injection, but Oreton proved less effective than Oreton-B. There was increased comb response from the administration of the two hormones simultaneously. Birds were induced to crow in 7 days after hatching by the administration of Oreton-B and Oreton, but in 5 days with Oreton-B alone.

The comb of the baby chick as a test for the male sex hormone, R. T. Frank, E. Klempner, and F. Hollander (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 853–856, figs. 2*).—The chick comb test for assaying the ♂ hormone (E. S. R., 78, p. 320) was made more sensitive and found to give more uniform results with chicks 3 days of age injected for 7 days with doses up to 50γ of androsterone in 0.05 cc. of sesame oil than previously when chicks 6 days of age were injected for 10 days with up to 500γ of androsterone in 0.1 cc. of oil. Comb weights plotted against dose had the same slope for ♂♂ and ♀♀, with a slightly higher intercept for ♂♂.

A corpus luteum-stimulating substance in the rat placenta, E. B. Astwood and R. O. Greep (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 713–716*).—The results of several experiments indicated that the fetal rat placenta secretes a substance, different from any known gonadotropic or lactogenic hormone, which is responsible for the maintenance and function of corpora lutea during the latter half of pregnancy. The hormone secreted by the developing chorion evidently maintains and enlarges the corpora lutea after the tenth

Characterization of gonadotropic hormones of the hypophysis by their sugar and glucosamine content, H. M. Evans, H. Fraenkel-Conrat, M. E. Simpson, and C. H. Li. (Univ. Calif.). (*Science, 89 (1939), No. 2307, pp. 249-250*).—The use of the carbohydrate and glucosamine contents of pituitary extracts as an indication of their relative gonadotropic potency is suggested.

The effect of anti-gonadotropic sera upon gonadotropic secretion in parabiotic rats, H. S. Kupperman, R. K. Meyer, and R. Hertz. (Univ. Wis.). (*Endocrinology, 24 (1939), No. 1, pp. 115-118*).—Prolonged injection of adult ♀ rabbits with an extract of sheep pituitary produced in the blood serum a substance which inhibited the gonadotropic secretion of the pituitary of a gonadectomized partner rat in parabiotic union with a normal ♀. Ovarian hypertrophy and extensive luteinization found in the controls were prevented by the antigonadotropic factor.

The preparation of concentrated antigonadotropic factor (antiprolan), B. Zondek, F. Sulman, and A. Hochman (*Biochem. Jour., 32 (1938), No. 11, pp. 1891-1896*).—On comparing various methods of antiprolan concentration from rabbit and goat serum, the authors give the three most promising methods—precipitation and preservation by treatment with acetone and ether, fractional precipitation with saturated ammonium sulfate, and isoelectric precipitation from dilute solutions poor in electrolytes. Combined methods produced still purer preparations.

An analysis of the mechanism of oestrogenic activity, G. Pincus and N. T. Werthessen (*Roy. Soc. [London], Proc., Ser. B, 126 (1938), No. 844, pp. 330-356, figs. 2*).—Differences in the time response of the vaginal smears of ovariectomized mice to different doses of oestrone furnished the basis for constructing mensuration curves for assaying the oestrogenic activity of 29 synthetic compounds which were introduced intraperitoneally. All of the synthetic products were far less active than the oestrones. Discussing the administration of oestrogens with progesterone, the authors suggest that some oestrogens, like those leading to ovum growth, are destroyed, whereas others may enter into a variety of compounds having increased action.

The immature rat uterus in the assay of estrogenic substances, and a comparison of estradiol, estrone, and estriol, H. D. Lauson, C. G. Heller, J. B. Golden, and E. L. Sevringhaus. (Univ. Wis.). (*Endocrinology, 24 (1939), No. 1, pp. 35-44, figs. 5*).—Response in weight of the uterus of the immature rat to injections twice daily for 3 days with an autopsy on the fourth day is suggested as the basis for a method of oestrogen assay. Changes in response to small unit doses suggested the accuracy of the method for assaying small quantities of oestrogen.

Effect of massive doses of an estrogen on ova transport in ovariectomized mice, R. Whitney and H. O. Burdick (*Endocrinology, 24 (1939), No. 1, pp. 45-49*).—In further studies of the effect of oestrogen on the movement of the ova of mice through the Fallopian tubes (E. S. R., 80, p. 330), ova were present in the tubes of mice from 68 to 122 hr. after finding the vaginal plug in cases where mice were ovariectomized from 1 to 12 hr. after mating. Ova were found in the uteri in from 51 to 61 hr. in 71 percent of such animals treated only with Progynon-B. It is concluded that hormone deficiency from ovariectomy results in retention of the ova in the tubes.

The isolation of estrone sulfate from the urine of pregnant mares, B. Schachter and G. F. Marrian (*Jour. Biol. Chem., 126 (1938), No. 2, pp. 663-669*).—A method is described for the isolation of a crystalline concentrate of oestrogen from the urine of pregnant mares. Some of the concentrate was identified as the potassium salt of oestrone sulfate contaminated with equilenin.

A difference of effect between the oestrogenic hormones and diethylstilboestrol, O. MÜHLBOCK (*Nature* [*London*], *143* (*1939*), *No. 3613*, *pp. 160, 161*).—Like other oestrogens, diethylstilboestrol on injection was found to suppress the capon comb development induced by testosterone. When administered by inunction in combination with testosterone, it did not suppress comb development.

The isolation of progesterone and 3,20-allopregnanolone from ox adrenals, D. BEALL (*Biochem. Jour.*, *32* (*1938*), *No. 11*, *pp. 1957–1960*).—Chemical methods effective in the isolation of progesterone and 3,20-allopregnanolone from ox adrenals are described.

The maintenance of embryo life in ovariectomized rabbits, G. PINCUS and N. T. WERTHESSEN (*Amer. Jour. Physiol.*, *124* (*1938*), *No. 2*, *pp. 484–490*).—It was found that by the subcutaneous administration of crystalline progesterone to rabbits ovariectomized after a fertile mating, pregnancy could be maintained and normal, living young were born. The subcutaneous administration of testosterone and pregnandiol enhanced the effects of progesterone in the early stages of gestation.

Maintenance of pregnancy by progesterone in rabbits castrated on the 11th day, W. M. ALLEN and G. P. HECKEL (*Amer. Jour. Physiol.*, *125* (*1939*), *No. 1*, *pp. 31–35*. *figs. 4*).—Although pregnancy could not be maintained by progesterone administration alone in rabbits castrated 18 hr. after mating (E. S. R., 78, p. 323), 2 mg. of progesterone per day was required to maintain pregnancy from the eleventh to fifteenth day and 4 mg. per day from the sixteenth to twenty-eighth day. With smaller doses the embryos were partially absorbed or aborted.

Action of oestrin and progesterone on the anterior pituitary, J. B. BROOKSBY (*Soc. Expt. Biol. and Med. Proc.*, *38* (*1938*), *No. 5*, *pp. 832–834*).—The administration of progesterone alone, oestrin alone, or a combination of the two to ovariectomized rats was found to prevent the castration changes expected in the pituitary. Evidently there was some synergistic effect of progesterone on oestrin, as the pituitary weights of controls were usually less than 10 mg., but after 10 days' treatment with both hormones the pituitary weights averaged about 18 mg. The weights following treatment with either of the hormones alone were intermediate between the controls and those receiving both hormones. The hormones prevented cellular castration changes in the pituitaries.

The effects of formalin on the thyroid-stimulating and gonadotropic hormones of cattle anterior pituitary glands, S. J. HAYWARD, J. H. POLLOCK, and L. LOEB (*Amer. Jour. Physiol.*, *125* (*1939*), *No. 1*, *pp. 113–118*).—The immersion of anterior pituitary glands from cattle in formalin for 3 or 7 days was found to destroy almost completely the atresic and luteinizing effects of implants of such glands on the ovaries of guinea pigs. However, such glands, even after long preservation, were found to induce heat changes in the guinea pig. Formalin solutions at pH 4 and 6 were most active in the above manner.

FIELD CROPS

[Agronomic research in California]. (Partly coop. U. S. D. A. and Wis. Expt. Sta.). (*California Sta.* [*Bien.*] *Rpt. 1937–38*, *pp. 11–13, 15, 16–20, 31, 32, 33, 47, 83–87*).—Recent accomplishments (E. S. R., 76, p. 780) are reported from breeding work with barley, wheat, grain sorghum, Sudan grass, beans, and cowpeas; cultural, nutritional, and rotation experiments with sugar beets; fertilizer studies with rice, peas, Ladino clover, cotton, and sugar beets; development and testing of soil-building crops, including fenugreek and other *Trigonella* spp.,

early melilotus, cowpeas, mat beans, and Calcarata vetch; biochemical studies of forage plants; effects of burning range brush; and weed control research dealing with chlorate herbicides, soil sterilization with arsenicals and borates, injection of carbon disulfide to kill roots of perennials, as morning-glory, use of sulfuric acid and Sinox as selective weed sprays, and acid-arsenicals and other translocated weed sprays. Productive varieties or strains of wheat, barley, grain sorghum, Sudan grass, beans, and cowpeas developed by the station are recorded.

[Field crops work in Delaware], G. L. SCHUSTER, C. E. PHILLIPS, and M. W. GOODWIN (*Delaware Sta. Bul. 214 (1938), pp. 11, 12, 13, 21*).—Brief reports are made on fertilizer experiments with wheat, yield tests of corn hybrids and varieties, trials of barley varieties and soybean selections, selection and improvement of Korean lespedeza, and the value of grass and grass drying.

[Field crops research in Florida]. (Partly coop. U. S. D. A. and Ga. Coastal Plain Expt. Sta.). (*Florida Sta. Rpt. 1938, pp. 39–45, 46, 46–59, 78, 79, 104, 152, 153, 156, 157–163, 176, 178–181, 182, 183, 186–188, 189, 195, 196, figs. 9*).—Reports of progress are made from continued investigations (E. S. R., 79, p. 469) at the station and substations by F. H. Hull, W. A. Carver, W. E. Stokes, G. E. Ritchey, W. A. Leukel, R. M. Barnette, J. P. Camp, J. D. Warner, H. H. Hume, R. E. Blaser, A. L. Shealy, W. G. Kirk, F. B. Smith, R. V. Allison, H. W. Winsor, F. S. Jamison, J. R. Beckenbach, J. R. Neller, W. T. Forsee, F. T. Boyd, T. Bregger, R. W. Kidder, F. D. Stevens, R. R. Kincaid, W. M. Fifield, H. S. Wolfe, and W. F. Ward, including breeding work with corn, oats, Napier grass, sea-island cotton, sugarcane, tobacco, and peanuts; variety tests with corn, oats, rye, grain sorghum, sorgo, sugarcane for sugar and sirup, potatoes, peanuts, cowpeas, soybeans, clover, and miscellaneous forage and pasture grasses and legumes and cover crops; production tests with ramie and ginger lily; variety, adaptation, and fertilizer tests with sea-island cotton; fertilizer tests with corn, oats, potatoes, ramie, peanuts, clovers, Dallis grass, and carpet grass; study of the development and deterioration of roots in relation to growth of pasture plants under different fertilizer and cutting treatments; response of corn and beans on Everglade soils to less common elements; composition factors affecting the value of sugarcane for forage and other purposes; physiology of the blooming of sugarcane; cultural tests with potatoes, corn, peanuts, velvetbeans, and cover crops; methods of inoculating legumes (white clover) in Florida soils; comparative production of pearl millet, sorgo, Napier grass, and Cayana sugarcane when grown for silage at relatively high fertility levels; germination of tobacco seed after 6 yr. in different types of storage, and tobacco plantbed fertilization; cowpeas and soybeans grown in rotation for summer cover and green manure; and crop rotation studies under Everglades conditions with corn, cotton, crotalaria, and Austrian winter peas, and corn and runner peanuts rotating with crotalaria and with native cover crops.

Additional pasture research included comparisons of native v. improved pastures, burned v. unburned native pastures for both 9 and 12 months' grazing, and of methods of land preparation previous to seeding improved pastures; effects of different fertilizer formulas on yields of Bahia and centipede grasses; the effect of fertilizers on the yield, grazing value, chemical composition, and botanical make-up of pastures; eradication of weeds in tame pastures and methods of ridding land of objectionable growths and obstacles; forage nursery and plant adaptation studies, and forage and pasture grass improvement; a grazing test comparing various grasses grown on cut-over sand hill land; growth behavior and relative composition of range grasses as affected by burning and the effect of burning on maintenance of natural grass stands and upon the estab-

lishment of improved grasses; studies of pasture legumes, of Napier grass for pasture purposes, and of water pasture; methods of establishing permanent pastures under various conditions; and pasture studies on peat and muck soils.

[Agronomic work in North Dakota]. (Partly coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 4, pp. 3–6, 10–15, 20–29, figs. 3*).—Articles reporting progress results include Hybrid Corn for North Dakota (pp. 3–6) and Which Corn Hybrids Are Useful in North Dakota? (pp. 23–25), both by W. Wiidakas; Durum Wheat Breeding, by G. S. Smith (pp. 10–12); Small Grain Varieties for North Dakota, by T. E. Stoa (pp. 12, 13); Why Grow Flax, by T. H. Hopper (pp. 13–15); Russian Knapweed in North Dakota, by E. A. Helgeson (pp. 20–23); and Seeding Grasses and Legumes for Pasture and Hay, by W. Whitman, T. E. Stoa, and H. C. Hanson (pp. 25–29).

[Agronomic work in South Dakota], A. N. HUME, F. J. LEBLANC, and T. R. WRIGHT. (Partly coop. U. S. D. A.). (*South Dakota Sta. Rpt. 1938, pp. 7–11, 40*).—Field crops investigations (E. S. R., 79, p. 473), reported on briefly, comprised breeding work with corn, durum and spring and winter hard red wheats, oats, barley, and alfalfa, and with sorghum for low hydrocyanic acid content; crop rotations for bindweed control; tests of barley and oats varieties; and an investigation of the possibilities of *Ephedra sinica* as a drug plant with a tendency to prevent soil erosion.

[Field crops research in Washington], E. G. SCHAFER, O. E. BARBEE, O. A. VOGEL, E. F. GAINES, W. HERMANN, W. A. HARVEY, D. C. SMITH, C. L. VINCENT, J. C. DODGE, W. J. CLORE, H. D. JACQUOT, H. P. SINGLETON, C. E. NELSON, C. A. LARSON, A. J. JOHNSON, and R. F. SACKMAN. (Partly coop. U. S. D. A. and Idaho Expt. Sta.). (*Washington Sta. Bul. 368 (1938), pp. 10–12, 14–16, 49, 50, 73–79, 82–84, 92*).—Agronomic experimentation (E. S. R., 79, p. 323), reported on from the station and substations, included variety tests with spring and winter wheat, barley, oats, rye, corn (and hybrids), potatoes, sugar beets, seed flax, alfalfa, sweetclover, grasses, and mixtures of forage crops; breeding work with barley, oats, wheat, sweetclover, potatoes, and forage grasses; a study of the effect of storage temperature and atmospheric composition upon sugar accumulation, sprout production, and weight loss of potato tubers; cultural (including planting) studies with wheat, oats, flax, crested wheatgrass, alfalfa, and sugar beets; wheat as a nurse crop with crested wheatgrass; tillage and soil moisture studies, with moisture usage by peas, wheat, and crested wheatgrass; fertilizer tests with alfalfa, sugar beets, beans, and with potatoes, corn, and wheat in rotation; crop rotations, including permanent fertility and organic matter maintenance studies; and weed control experiments.

A comparative study of the subterranean members of three field grasses, H. J. DITTMER (*Science, 88 (1938), No. 2290, p. 482*).—As indicated by their relative total numbers, lengths, and areas of roots and root hairs, Kentucky bluegrass was considered far superior to rye and oats, in order, for soil binding and retarding erosion.

The emergence of grass and legume seedlings planted at different depths in five soil types, R. P. MURPHY and A. C. ARNY. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 1, pp. 17–28*).—The total and rates of emergence were determined for five grasses and five legumes planted 0, 0.5, 1, 2, and 3 in. deep on five soil types in the field and greenhouse.

Planting depth was found to be the major factor determining total emergence of seedlings of individual crops. About 0.5 in. deep was satisfactory for the species used, although surface planting produced good stands under conditions ideal for emergence. Timothy and crested wheatgrass made optimum stands in the field from 0.5-in. depth while plantings 1 in. deep were not so satisfactory,

especially on Clinton silt loam. Reed canary grass planted 1 in. deep emerged well on all soil types, and bromegrass emerged satisfactorily from the 2-in. depth on all soils except Clinton silt loam. Alfalfa and sweetclover produced uncertain stands at 1-in. depths in the field on all soil types except Fargo silty clay loam. Red clover made satisfactory emergence at 1-in. depths on all soil types. It appeared that bromegrass can be mixed and sown with grain crops if no other satisfactory seeding method is available.

Seed weights of 18 species of grasses and legumes tested in the greenhouse on all soil types showed a significant positive correlation with total emergence from 2- and 3-in. planting depths.

Surface plantings gave the highest percentage of emergence for all crops on Carrington heavy silt loam and on Clinton silt loam. In the field total emergence was definitely greater from the 0.5-in. plantings than from surface plantings on Fargo silty clay loam and Merrimac loamy fine sand. Total emergence from the deeper plantings was somewhat higher on Fargo silty clay loam than on other soils and was lowest on Clinton silt loam.

Environmental conditions influenced rate of emergence more than the other variables. Emergence was nearly complete 15 days after planting for all species. The legumes reached maximum emergence about 5 days before the grasses, indicating that conditions desirable for emergence must continue somewhat longer after planting for grasses.

Native and adapted grasses for conservation of soil and moisture in the Great Plains and Western States, M. M. Hoover (*U. S. Dept. Agr., Farmers' Bul. 1812 (1939), pp. [2]+44, figs. 53*).—The characteristics, distribution, use, value for erosion control, and planting practices are described for 30 grasses, including the wheatgrasses, buffalo grass, bluestems, gramas, Bermuda grass, wild-rye, *Hilaria* spp., Sudan grass, bluegrasses, panic grasses, dropseeds, and needlegrasses. Special equipment used in collecting, cleaning, and planting and the processing of native grass seed are described and illustrated.

Grass culture and range improvement in the central and southern Great Plains, D. A. Savage (*U. S. Dept. Agr. Circ. 491 (1939), pp. 56, figs. 23*).—The results of limited grass investigations made in the drier parts of the central and southern Great Plains during the past 50 yr., together with general observations by research workers in the region, are reviewed and used as a basis for tentative suggestions on grass culture and range improvement. Adapted and sand grasses and other grasses and plants are described, with comments on their characteristics and merits. The bibliography comprises 76 titles.

Detailed surveys at 11 locations in the region showed that from 25 to 40 yr. or longer were needed in the past for abandoned farm land to revert naturally to a good stand of native grasses. However, natural recovery may be hastened effectively by using properly established well-adapted grasses and taking advantage of favorable growing seasons. In most of the region where soil blowing is severe, high-cut stubble of close-drilled Sudan grass affords a satisfactory seedbed for perennial pasture grasses. Blue grama, buffalo grass, side-oats grama, galleta grass, and several other adapted grasses may be seeded alone, in mixtures with each other, or in conjunction with resodding of buffalo grass more successfully than with nurse crops. Most adapted grass species may be sown to best advantage medium early in the spring, although winter-growing grasses respond better when seeded in the fall or early in the spring. A combination of drilling and broadcasting at about 1-in. depth offers possibilities for better stands of perrenial grasses than either method alone. Clipping at about 8 in. high is advised for weed control on newly seeded areas,

and livestock should be excluded during the first growing season and part of the next from reseeded areas.

Reseeding of depleted pastures is more difficult than on cultivated land but may succeed in favorable seasons when adapted seed is sown early in the spring before weeds and other plants start growth. Mowing has controlled sand sagebrush on native pastures and improved the growth of associated grasses. Deferred and rotation grazing offers the surest means of improving badly damaged pastures and maintaining them in thrifty condition.

Pasture improvement in the Gulf coast prairie of Texas, R. H. STANSEL, E. B. REYNOLDS, and J. H. JONES (*Texas Sta. Bul. 570 (1939), pp. 43*).—Experiments with pasture and forage plants over 25 yr. at Angleton led to the recommendation of Dallis, Bermuda, carpet, and Angleton grasses, California bur-clover, White Dutch clover, and common lespedeza for permanent pastures in the Gulf coast prairie region. Adequate drainage, mowing to control weeds, and seeding of desirable and adapted pasture plants contributed to the establishment of good improved pastures, while the use of fertilizers was not profitable. To establish a good sod with seeding and mowing, 2 yr. were needed, and 4 yr. with mowing alone. The seeded pasture contained more kinds of grasses in a more uniform mixture than the mowed pasture. Mowing twice a year resulted in the gradual replacement of the tall-growing bluestem grasses by lower-growing grasses and legumes, as Bermuda grass, carpet grass, and lespedeza.

Improved permanent pasture had a greater carrying capacity and produced more total gain per steer yearly than unimproved native pasture. Steers on native pasture gained faster in early spring and reached their highest condition in June, while steers on improved pasture continued to gain during the summer and fall and reached their highest condition in October. The better results on improved pasture were ascribed to the more nutritious herbage and to the longer productive grazing period.

When grown in pure stands, native bluestem grasses produced higher forage yields than Bermuda, carpet, Dallis, and Angleton grasses. All of these grasses, except Bermuda, yielded more when cut at maturity than when harvested at monthly intervals, but the young succulent growth of monthly harvested grasses contained more protein, fat, phosphorus, and calcium and was decidedly more palatable than growths harvested at maturity. Bermuda, Dallis, and Angleton grasses when harvested at monthly intervals contained enough phosphorus for the nutrition of livestock, while carpet grass and native grass did not. When mature, none of the grasses contained enough phosphorus for adequate nutrition. Only saltgrass appeared to be deficient in calcium content at any growth stage. Saltgrass, of relatively low feeding value, was superior to the mature and dead native grasses.

Crop rotation studies, G. O. BAKER and K. H. W. KLAGES (*Idaho Sta. Bul. 227 (1938), pp. 34, figs. 12*).—Yield data are reported from crop rotation experiments at Moscow 1915–37, Sandpoint 1924–32, Tetonia 1925–37, and Aberdeen 1929–37, and characteristics of rotations applicable to conditions in different parts of Idaho are discussed.

Trend evaluations (E. S. R., 80, p. 474) indicated yield expectations with similar sequences of cropping begun under comparable environmental conditions. High-yielding plats in the various rotations generally also showed relatively high upward yield trends, while the lower yielding plats showed either low or definite negative trends. Manure in rotations at Moscow led to significant yield increases in all crops except peas. Direct effects of variable crops and fallow preceding wheat in 3-yr. rotation systems containing wheat and

oats as common crops were illustrated by the relative performances of wheat continuously at 100, after fallow 246, potatoes 220, peas 202, corn 154, and sunflower 113. Exact evaluations of the variable crops in their respective effects on wheat yields in the different rotations differ somewhat, yet their relative effects remain the same regardless of the periods of comparison and whether or not the rotation included manure. Wheat yields in the wheat, oats, pea, and the wheat, oats, fallow rotations showed the economy of substituting peas, at least in part, for fallow. Oats yielded highest in the wheat, oats, pea, rather than in the wheat, oats, fallow rotations.

Four-year rotations at Aberdeen showed the influences of alfalfa, in particular, and red clover and peas in the rotation on yields of potatoes and wheat with and without manure. Crop yields in the different rotation systems indicate that, up to the present, availability of moisture rather than soil fertility is the main limiting factor to profitable crop production in the Tetonia area.

1937 report of the uniform alfalfa nurseries, H. L. Westover and H. M. Tysdal (*U. S. Dept. Agr., Bur. Plant Indus., 1938, pp. [1]+16*).—Observational data on recovery, fall growth, seed production, and leaf spot, and resistance to bacterial wilt on numerous strains of alfalfa are compiled, and yields relative to Grimm are reported from nine stations. Yields of Ladak, Hardigan (A68), and Baltic were slightly higher than yields of Grimm and yields of Hardistan were lower, resembling results on a number of field plat tests.

Extension of alfalfa roots into subsoil dried by a previous crop, W. H. Metzger and C. O. Grandfield. (Kans. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 1, p. 80*).—Plats on old alfalfa land from which subsoil moisture had been removed to about the wilting coefficient to depths of about 20 ft. were fallowed from one summer to 5 yr. before reseeding to alfalfa. A plat fallowed one summer and since holding a 4-year-old stand had accumulated water to a depth of 8 ft. or less before the new seeding, and roots could not be traced below depths from 10 to 12 ft. except in old root channels. In a plat fallowed 3 yr. before reseeding and bearing a 2-year-old stand, moisture was regained to above wilting coefficient throughout the depth dried out by previous alfalfa, and roots could be traced down to from 19 to 20 ft. deep.

Immediate effect of cross pollination on the carotenoid pigments in the endosperm of maize, I. J. Johnson and E. S. Miller. (Minn. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 1, pp. 88–92*).—Further study on the magnitude of differences among inbred lines of corn in concentrations of total carotenoid pigments (E. S. R., 80, p. 324) included a survey in 1937 with a larger series of inbred lines, and a study to determine immediate effects on the endosperm of cross-pollination between groups of high and low carotenoid-pigment strains.

Significant variations were found to occur with reference to carotenoid-pigment concentration of the 35 inbred lines studied. When inbred lines were grouped into dark, medium, and light yellow in endosperm color, the difference in total carotenoid pigments was significant only between the dark and light groups. Crossed seed derived from high female × low male and low female × high male was significantly different from the female parent, indicating that carotenoid pigments are subjected to the usual xenia effects. The lack of significant correlation between concentration of carotenoid pigments in endosperm of inbred lines and that in leaf tissues (E. S. R., 80, p. 761) suggested that the two are due to independent factors or physiological processes.

The importance of corn hybrids to the corn industry, M. T. Jenkins. (U. S. D. A.). (*Contrib. Iowa Corn Res. Inst. [Iowa Sta.], 1 (1939), No. 2, pp. 208–212*).—The status and prospects of the production of hybrid corn are re-

viewed, with comments on methods used, characteristics and possible commercial advantages of hybrid corn, and on recent findings in research with the crop.

Hybrid corn in Kansas, R. W. JUGENHEIMER. (Coop. U. S. D. A). (*Kansas Sta. Circ. 196 (1939), pp. 20, figs. 13*).—Methods followed in the cooperative development of corn hybrids are outlined, with information in part derived from Iowa Station Bulletin 366 (E. S. R., 78, p. 620) on the commercial production of hybrid corn and precautions in its use to be observed by the grower.

Measuring hybrid corns for Michigan, A. R. MARSTON (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 151–160, figs. 4*).—Several corn hybrids and varieties are indicated for each of the corn-growing zones of Michigan from results of the cooperative tests, 1935–38, reported. Hybrids of proven value certified by the Michigan Crop Improvement Association, described with adaptations, include Michigan Hybrids Nos. 561 and 1218 and Minnesota Hybrid No. 402, all noted earlier (E. S. R., 79, p. 46), and Wisconsin Hybrids Nos. 606 and 645. Wisconsin Hybrid No. 606 matures about 4 days earlier than Michigan Hybrid No. 561, may be used for silage in the same general region and for grain production, and is adapted to southern Michigan. Wisconsin Hybrid No. 645 is slightly later and more productive than Wisconsin Hybrid No. 606 where it will mature.

A brief discussion of the history of cotton: Its culture, breeding, harvesting, and uses, H. B. BROWN (*Baton Rouge: La. State. Dept. Agr. and Immigr., 1938, 4. ed., pp. 15, [figs. 4]*).—A popular treatise.

Cotton growing in the Philippines, A. ELAYDA and F. DE JESUS (*Philippine Jour. Agr., 9 (1938), No. 1, pp. 119–133, pls. 4*).—Practical information is given on varieties, soil and climatic needs, producing areas, cultural methods and field practices, production costs, and cotton insects and diseases and their control. See also an earlier note by Espino (E. S. R., 45, p. 738).

First Conference of Scientific Research Workers on Cotton in India, March 1937, Papers Read and Summary of Proceedings (*Bombay: Indian Cent. Cotton Com., 1938, pp. [1]+444, pls. [30]*).—Report is made on the proceedings of the conference held in Bombay, March 4–6, 1937. Papers of interest to agronomists, plant breeders, and technologists included Watering Experiments on Cotton at the Cotton Research Station, Risalewala, Lyallpur, by M. Mohammad Afzal (pp. 86–97); Note on Factors in the Acclimatisation of Exotic Varieties of Cotton in Sind (pp. 98–118), and The Cotton Leaf as an Index of the Physiological Requirement of the Cotton Plant (pp. 119–125), both by B. M. Dabral; Cotton Agronomy, by M. U. Barakzai (pp. 126–133); The Saline Soils of Sind and the Cotton Plant, by M. A. Shama Iyengar (pp. 134–138); Influence of Twist on Yarn Strength, by N. Ahmad and V. Venkataraman (pp. 153–176); The Deterioration of Broach Palej Cotton on Storage, by A. N. Gulati (pp. 177–194); Spinning Tests With New Strains of Hyderabad-Gaorani (*Gossypium indicum* Lamk.) Cotton Grown in Successive Seasons or in Different Localities (pp. 195–203), and Cotton Problems of Hyderabad State (pp. 263–278), both by K. Sawhney; Effects of Rainfall on the Quality of Indian Cottons, by R. S. Koshal and N. Ahmad (pp. 204–262); Breeding for Wilt Resistance in Cotton, by B. N. Uppal (pp. 279–295); The Genetics of *Gossypium* and Its Application to Cotton Breeding, by J. B. Hutchinson, P. D. Gadkari, and M. A. A. Ansari (pp. 296–327); Some Aspects of Cotton Breeding Work in India, by V. Ramanatha Ayyar (pp. 328–340); Advantages and Disadvantages of the Back-Cross Method in Plant Breeding, by S. J. Patel (pp. 341–345); The Distribution of *Gossypium* and the Evolution of the Commercial Cottons, by J. B.

Hutchinson (pp. 347–368); Floral Anatomy as an Aid to the Classification of Cottons, by P. Abraham and V. Ramanatha Ayyar (pp. 369–379); Breeding of Improved Strains of Cotton Suited to Local Conditions, With Particular Reference to Sind and Their Extension, by K. I. Thadani (pp. 380–392); Some Effects of X-Rays on Uppam and Karunganni Cottons, by V. Ramanatha and R. Balasubramania Ayyar (pp. 393–400); Cotton Breeding in the Central Provinces and Berar, by D. N. Mahta (pp. 401–409); The Delimitation of Areas for Strains of Agricultural Crops, With Special Reference to Cotton, by V. G. Panse (pp. 411–423); and Discussion of Sampling Methods in Developmental Studies on Cotton and the Statistical Treatment of Results, by M. Vaidyanathan (pp. 424–436).

Papers on cotton entomology included The Control of Pink Bollworm (*Platyedra gossypiella* Saund.), by P. B. Richards (pp. 8–35); Carry-Over of Pink Bollworm (*Platyedra gossypiella* Saund.) Through Soil in the Mahratwadda Division of the Hyderabad State, by H. D. Nangpal (pp. 36–53); A Brief Account of the Investigation on Spotted Bollworms in South Gujarat, by B. P. Deshpande (pp. 54–65); The Cotton Jassid, by M. Afzal Husain (pp. 66–77); and Preliminary Observations on the Distribution, Food Plants, and Original Home and Habitat of *Pempheres affinis* Fst., the Cotton Stem Weevil of South India, by P. N. Krishna Ayyar (pp. 78–83, 442–444).

A compilation of information on kudzu, I. E. Miles and E. E. Gross (*Mississippi Sta. Bul. 326 (1939), pp. 14, figs. 11*).—Information compiled from reports of experiments by State experiment stations and other sources covers the uses of kudzu (*Pueraria thunbergiana*) for erosion control, soil improvement, and shade, grazing, hay, vegetating water terrace disposal systems, and road bank protection.

[Potato production research] (*Ind. State Veg. Growers' Assoc., [Ann. Rpt.], 9 (1938), pp. 24–38, 53–58*).—Recent research with the potato crop is described in papers entitled New Developments in Potato Production, by E. V. Hardenburg (pp. 24–27) (Cornell Univ.); To Spray or Not to Spray (pp. 27–30), What the Ohio Experiment Station Has Learned About Growing Potatoes on Muck Soil (pp. 33–38), and Large Scale Potato Production on Muck in Ohio, New York, and California (pp. 53–58), all by J. Bushnell (all Ohio Expt. Sta.); and Potato Production on Mineral Soils, by W. B. Ward (pp. 30–32), and New Varieties and Old, by N. K. Ellis (pp. 32, 33) (both Purdue Univ.).

The role of green manures in potato production, E. R. Purvis and J. M. Blume. (Va. Truck Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 2, pp. 32–36*).—Beneficial effects of green manures of soybeans and sorghum upon potato yields on two soil types are reported. Fresh organic matter was about three times as effective in increasing yield as was residual organic matter. It was shown that green manure crops add plant nutrients to the soil in amount about equivalent to 1 ton per acre of a 7–2–5 fertilizer.

Twenty-five years in the history of the potato, F. A. Krantz. (Minn. Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 2, pp. 25–31*).—Advances in potato improvement are summarized with remarks on progress in other phases.

The Pontiac potato, H. C. Moore and E. J. Wheeler (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 174, 175*).—Pontiac, a seedling potato chosen by the station from among progeny of a Katahdin (E. S. R., 74, p. 630) × Bliss Triumph cross (made in 1930 by the U. S. Department of Agriculture), is a late-maturing red potato, round to oblong shape, with medium deep eyes and crisp white flesh, and its plant has large, dark green, rough-textured leaves and makes vigorous upright growth. It has not shown marked resistance to insect

and disease attacks but has not been much more susceptible than are standard varieties. Mosaic has been the major virus disease observed in Pontiac plats. In some trials in Michigan and Iowa Pontiac proved more drought-resistant than other varieties and was freer from hollow heart and misshapen tubers. On muck plats at East Lansing, 1936–38, Pontiac usually outyielded other varieties, and on sandy loams in 1937 and 1938 it averaged slightly better than Russet Rural and Katahdin and about the same as Chippewa in yields of U. S. No. 1 potatoes. It has been grown in trial plats in Florida, Louisiana, Iowa, and North Dakota with encouraging results.

A preliminary report on the waxing of seed potatoes, E. V. Hardenburg and H. Platenius. (Cornell Univ.). (*Amer. Potato Jour., 16 (1939), No. 2, pp. 37–40*).—Treatment of Heavyweight (Smooth Rural) seed potatoes with a 30-percent 231–B wax emulsion while still in a dormant condition resulted in stimulation of sprout growth, earlier emergence of plants, and a corresponding increase in yield, these results seeming due to conservation of moisture accompanied by sprout growth stimulation in the treated tubers. Beneficial effects of waxing appeared similar to those produced by green sprouting. Further studies would determine effects of waxing on respiration of seed treated immediately after harvest and on subsequent yield.

Bruising, freezing, and chemical injury of potatoes in transit, R. C. Wright (*U. S. Dept. Agr., Tech. Bul. 668 (1939), pp. 23, figs. 12*).—Injury to potatoes next to floors or floor racks and in some cases next side walls in carlots of sacked potatoes, sometimes attributed to freezing or to damage from chemicals on the floor or walls, appears primarily to result from mechanical bruising against the floor or side walls caused by the load weight and car movement. The several types of injury are described and illustrated.

In simulated transit tests to determine effects of storage treatment and tuber temperature on susceptibility to floor bruising, 65 percent of the potatoes in lots from storage at 32° F. for 3 mo. were injured, 31 percent of those from a 50° storage were injured, and 54 percent of potatoes from cellar storage at about 50° and subsequently held for 3 days at 32° before the test were injured. Transit bruising under experimental conditions was identical with that under commercial conditions. Chemical injury occurred only in cases where the skins of potatoes were broken when in contact with soluble chemicals, showing that it was secondary to mechanical injury. Freezing injury usually occurred independently of injury from bruising.

Early cutting and fertilization of quack grass meadows, S. T. Dexter and D. L. Clanahan (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 176–179*).—Quack meadows in cooperative tests, 1936–38, in the Michigan Upper Peninsula when treated about May 1–7 with 200 lb. of ammonium sulfate per acre broadcast and cut early, June 17–25, produced about double the yield of protein (9.13 v. 6 percent) and about 0.5 ton per acre more hay of better quality than unfertilized meadows cut late, July 8–15, the current practice. Relatively little increase in yield was obtained by permitting fertilized hay to stand until late cutting, while the quality decreased markedly. The merits of this practice and of growing a crop of alfalfa are compared.

Hydrocyanic acid content of sorghum varieties, J. F. Couch, R. R. Briese, and J. H. Martin. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 4, pp. 146–161*).—Plant and leaf samples of 33 sorghum varieties grown at one or more stations in the Great Plains area (1936–37), analyzed at various growth stages, gave HCN contents of the dried leaves ranging from about 12 to 75 percent of that of the whole green plant. It appeared that any variety tested may

at times contain sufficient HCN to be toxic to animals. There was some tendency for the content to be high where summer precipitation was lowest, but there was no consistent relation with temperature.

A brief discussion of the history of sugar cane: Its culture, breeding, harvesting, manufacturing, and products, W. G. TAGGART and E. C. SIMON (*Baton Rouge: La. State Dept. Agr. and Immigr., 1938, 3. ed., pp. 20, [figs. 4]*).—Popular information is given on the history and production of sugarcane and its products in Louisiana.

The timothy crop, M. W. EVANS (*U. S. Dept. Agr. Leaflet 171 (1939), pp. [1]+6, figs. 2*).—Practices for growing timothy for hay, pasturage, silage, and seed (E. S. R., 75, p. 338) are outlined, with information on adaptation, improved varieties (E. S. R., 70, p. 179), use, and feeding value.

Relation of latitude to the growth of timothy, M. W. EVANS. (U. S. D. A.). (*Amer. Jour. Bot., 25 (1938), No. 10, p. 4s*).—Plants of 9 selections of timothy, ranging by fairly uniform gradations from very early to very late, were grown at 10 stations at intervals from Gainesville, Fla., to Fort Vermilion, Alta. In the South selections which were progressively later had progressively shorter stems, but in the North stems of later selections grew to as great or even greater lengths than those of early selections. The season for blooming for the earliest selections progressed northward as the season advanced. For the latest selections, which need a longer day than earlier ones for development of culms and inflorescences, blooming occurred first at some midlatitude. From this latitude the season for blooming progressed both northward as the temperatures became suitable for growth and southward as the number of hours of daily illumination gradually increased. At a southern station late selections produced smaller hay yields than early selections which are better adapted to the relatively short days occurring there, but at a northern station both early and late selections produced relatively large yields. See also an earlier note (E. S. R., 74, p. 193).

Factors that influence the injury to wheat from freezing, R. B. HARVEY. (Univ. Minn.). (*Northwest. Miller, 197 (1939), No. 4, Sect. 1, pp. 22, 23*).—Freezing tests were made on plants of Thatcher, Ceres, and Marquis spring wheats and Minturki winter wheat taken in sods from wheat fields when in the boot and heading stages. When held at 22°, 25°, and 28° F., the leaves froze first in all tests, and then the spikes and finally the stems froze. Stem internodes were the most resistant. Freezing began at the tops of stems before the bases, and top leaves froze before bottom leaves. In general, wheat in these two stages had all the leaves and spikes killed at 22°, whereas stems showed up to 50 percent survival. The extent of injury to stems was decreased at 25° to one-fourth or less, and leaves and spikes seven-eighths or less. At 28° the stems mostly remained unfrozen, but leaves and spikes were at least one-eighth frozen. The neck just below the spike seemed to be especially sensitive to freezing. Injury after freezing was confined to cell areas actually frozen, but after 3 days tissues depending on frozen tissues for transport of water and food materials dried up. Variety, relative hardened condition of plant, waxy covering on leaves and stems, concentration of sugars in cell sap, and types of freezing weather endured are discussed briefly in relation to freezing injury.

A critical study of technique for measuring granulation in wheat meal, W. W. WORZELLA and G. H. CUTLER. (Ind. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 5, pp. 329–341, figs. 2*).—Meal granulation or degree of particle fineness, regarded as an important component of wheat quality, is of considerable interest to the miller, cereal chemist, geneticist, and plant breeder. Experiments on a critical study of technic for measuring meal granulation were con-

ducted with Michikof, Michigan Amber, and Purdue No. 1 wheats over 2 yr., during which more than 2,000 samples were sifted.

The following technic was adopted from results obtained in a systematic study of 11 steps in the procedure. Ten gm. of clean, sound, normal wheat containing about 10 percent of moisture are ground into a fine meal. Immediately after grinding a 2.5-gm. sample is weighed and transferred to the larger sieve (60- and 270-mesh sieves) and sifted for 1 hr. in the granulometer. The weight of material that passes through the finer sieve or into the pan is expressed as percentage of total and is designated as particle-sized index. A low index indicates a coarse meal and a higher index indicates a relatively finer meal. A new apparatus developed—the granulometer—and the nature of meal fractions are illustrated and described.

Inspection of agricultural seeds, H. R. Kraybill et al. (Coop. U. S. D. A.). (*Indiana Sta. Circ. 239 (1938), pp. 127, fig. 1*).—The purity, germination, and weed seed contents, and for legumes the hard seed contents are tabulated from tests of 1,381 official samples of seed collected from dealers in Indiana during the year ended June 30, 1938.

Seed inspection, F. A. McLaughlin (*Massachusetts Sta. Control Ser. Bul. 96 (1938), pp. 102*).—The purity, germination, and weed seed contents are tabulated for 273 official samples of field crops seed and mixtures and germination for 560 samples of vegetable seed collected in Massachusetts during the year ended December 1, 1938. Results of type and performance studies with seed oats, in cooperation with W. G. Colby; and field tests for trueness to type and variety on 120 lots of beans, beets, carrots, endives, lettuce, onions, parsnips, peas, radishes, spinach, and Swiss chard, in cooperation with G. B. Snyder, are included, with remarks on the quality of onion seed produced in the Connecticut Valley in the 1937 season and cleaning tobacco seed for growers. Studies of flower seeds made in cooperation with J. L. Anderson and C. L. Thayer, including tests of 172 samples of seed for purity, germination, and performance, are appended.

[Seed and inoculant investigations] (*New York State Sta. Rpt. 1938, pp. 13, 30, 31*).—Brief progress reports are made on the inspection of commercial legume inoculants and seed testing, studies on occurrence of weed seeds and their viability and on hard seed in garden peas, and drill surveys of barley and oats (E. S. R., 80, p. 191).

Chemical soil fumigation for more luxurious growth and weed control, F. L. Howard and F. L. Stark, Jr. (R. I. Expt. Sta.). (*Seed World, 44 (1938), No. 14, pp. 12, 13, figs. 3*).—Fumigation of soil by injection of liquid chloropicrin resulted in increased yields of mangels, rutabagas, and millet, and a number of truck crops, and freedom from certain diseases. Treatment of compost soil for top dressing turf has killed weed seeds. Conditions essential to success with this method are described.

Chloropicrin soil fumigation, F. L. Howard and F. L. Stark, Jr. (R. I. Expt. Sta.). (*Seed World, 45 (1939), No. 8, pp. 8, 9, 25, 28, figs. 5*).—Additional information is given on methods of applying chloropicrin for weed control, etc., and on conditions where soil fumigation is practical.

HORTICULTURE

[Horticultural studies by the California Station] (*California Sta. [Bien.] Rpt. 1937–38, pp. 9, 10, 21, 22, 23, 24–28, 34, 35, 87–94, 102–104, 110*).—Included are reports relating to the comparative yield and quality of plants in water and soil cultures; breeding of onions; development of new tomato varieties; straw-

berry, almond, and grape breeding; development of effective insect-resistant grape rootstocks; testing of blight-resistant pear stocks; influence of rootstocks on lemon yields; causes of premature decline in lemon trees; fertilization of citrus trees; irrigation of fruit and nut trees; pollination of deciduous fruits; thinning of the apricot; pruning wine grapes; development of citrus dusting equipment; improvement of orchard heaters and heating technics; use of blowers for frost protection; precooling of vegetables and melons prior to long-distance shipments; maturity studies with grapes; temperatures for wine grapes; and gas storage of fruits.

[Horticultural studies by the Delaware Station], L. R. Detjen, E. W. Greve, and F. S. Lagassé (*Delaware Sta. Bul. 214 (1938), pp. 27–29*).—Presented are brief progress reports on studies relating to the effect of the removal of the largest fruit from clusters on, and the relation of plum curculio injury to, the physiological dropping of fruits, the normal variation in the growth of apples on seedlings and on own roots, cover crops for apple orchards in Sussex County, and the value of various English rootstocks for Blaxtayman and Gallia Beauty apple trees.

[Horticultural studies by the Florida Station], F. H. Hull, W. A. Carver, R. W. Ruprecht, G. H. Blackmon, R. D. Dickey, F. S. Jamison, R. J. Wilmot, A. L. Stahl, J. C. Cain, J. V. Watkins, J. H. Jefferies, A. F. Camp, G. R. Townsend, J. R. Beckenbach, J. R. Neller, W. T. Forsee, H. S. Wolfe, and W. M. Fifield (*Florida Sta. Rpt. 1938, pp. 45, 80, 81, 90–98, 100–104, 105, 106, 107, 108, 140, 142–145, 151, 152, 172, 173, 184, 185, 186, 188, 189, 190, figs. 4*).—Studies the progress of which is discussed include sweet corn breeding; varieties, culture, fertilizers, and handling of pecans; propagation and culture of tung-oil trees; use of manganese sulfate as a corrective for chlorosis affecting ornamentals; varieties and storage of gladiolus; fertilization of celery and other vegetables; relation of N absorption to food storage, growth, and reproduction in pecans; varieties of fruits and ornamentals; cold storage of citrus fruits; relation of appearance, texture, firmness, and color of citrus fruits to their quality as measured by chemical tests; relation of soil reaction to growth and yield of beans, eggplant, and tomatoes; selection and development of vegetables adapted to Florida; effects of green manure crops on growth, yield, and quality of vegetables; and the effect of certain root-inducing substances on cuttings.

Studies at the Citrus Substation include varieties and breeding of citrus, the effect of mulching and cultivation on growth and yield, and the effect of Mg on the bronzing of citrus trees.

Projects at the Everglades Substation include citrus, tung-oil, and pecan tree trials, fertilizer requirements of vegetables and citrus, testing of varieties of vegetables at different fertility levels, and control of puffiness in the tomato.

Subtropical Substation projects reported relate to citrus and avocado culture, improvement of tomatoes by selection of new hybrids, tomato culture, and vegetable variety trials.

[Horticultural investigations by the South Dakota Station], L. L. Davis (*South Dakota Sta. Rpt. 1938, pp. 34–36*).—Included are brief reports on the breeding of roses, apples, and apricots; genetics of hardy, thornless rose stocks; development of hybrid drought-resistant sweet corn; and the production of sweet, firm-fleshed tomatoes with a minimum of seeds.

[Horticultural studies by the Washington Station], J. L. St. John, F. Van Amburgh, O. M. Morris, F. L. Overley, J. B. Rogers, E. L. Overholser, L. B. Wooton, J. Marshall, C. D. Schwartze, W. J. Clore, G. A. Huber, C. L. Vincent, L. C. Wheeting, S. E. Wadsworth, C. A. Larson, and D. J. Crowley. (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 368 (1938), pp. 27, 47, 48, 49,*

50, 51–55, 55–59, 79–82, 86, 87, 88, 89).—Brief reports are presented on the following investigations: Characteristics of maturing apples, orchard cover crops, relation of fruit maturity to storage, methods of propagating hardy apple stocks, causes of winter injury to fruit trees, factors affecting the set of fruit in Washington orchards, nature of spray injury to fruit trees, strawberry and raspberry breeding, orchard fertilization and irrigation, selection and breeding of truck crops, fertilizer requirements of vegetables, fruit handling and storage, soil moisture relationships in orchards, varieties of fruits and vegetables, and the fertilization and irrigation of cranberries.

Annual reports of the Canal Zone Experiment Gardens for the fiscal years 1935 and 1936, J. E. Higgins and W. R. Lindsay (*Canal Zone Expt. Gard. Ann. Rpts., 1935–36, pp. 59, pls. 12*).—These general reports include information on the production of rubber- and insecticide-yielding plants, tropical waterlilies, mangosteens, mangoes, coconuts, citrus, teak, bamboo, and other plants.

[Vegetable crop investigations by the New York State Station] (*New York State Sta. Rpt. 1938, pp. 29, 33–35*).—Included are brief reports on the following studies: Breeding mosaic-resistant cucurbits; placement of fertilizers; use of granulated fertilizers; supplementing rye cover crop with fertilizers; use of borax for preventing physiological break-down of beets; testing of new forms of phosphorus; methods of fertilizing to overcome the soil-exhausting effects of beets; breeding of muskmelons, squash, sweet corn, and tomatoes; comparison of southern- and home-grown tomato plants; and the effect of size of Golden Cross Bantam seed on yield, time of maturity, etc.

Varieties for the vegetable garden, H. Mattson (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 4, pp. 15, 16*).—A list of adapted and desirable varieties is presented.

A further report on the storage of vegetable seeds, L. V. Barton (*Contrib. Boyce Thompson Inst., 10 (1939), No. 2, pp. 205–220, figs. 4*).—Using the same material and methods employed in earlier studies (E. S. R., 75, p. 46), the author reports that the viability of lettuce, onion, and cauliflower seeds stored at room temperature may be prolonged markedly by adjusting the moisture contents to from 6 to 8 percent. Favorable results were also secured with tomato, carrot, and eggplant. In the case of pepper, moisture reduction was beneficial, but lowering of the temperature was needed for successful storage beyond 4 yr. Germination tests of old and fresh seeds stored for short periods at various relative humidities and temperatures indicated that with relative humidities of 50 percent or lower the temperature may be as high as 35° C. (95° F.) for seeds with high germination power and the storage period as long as 3 mo. without serious impairment of germination. Above 50-percent relative humidity and storage temperatures of 20° or lower were required. Pretreatment of lettuce seed on a moist medium at 25° or below permitted germination at high temperatures which are ordinarily prohibitive. Pretreated seed may be dried at room temperature for at least 3 days, after which a germination of 50 percent can still be secured at 30° and 25 percent at a temperature of 35°. Vigorous carrot, eggplant, onion, tomato, and lettuce seedlings were secured from 6-year-old seed stored under favorable conditions. A slight initial retardation of growth was noted in cases of unfavorable storage conditions.

Superb Golden, a new hybrid muskmelon, C. H. Mahoney (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 225–227, fig. 1*).—In connection with an account of the parentage and development there are presented a description of the fruit and recommendations as to harvesting and handling. Since Honey Dew

was one of the parents, storage for several days at from 70° to 75° F. is needed to increase the sugar content and permit full development of flavor.

The use of the analysis of covariance and its limitation in the adjustment of yields based upon stand irregularities, C. H. Mahoney and W. D. Baten. (Mich. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 5, pp. 317–328*).—The analysis of covariance between yield of marketable ears and stand of plants is presented for 26 hybrid strains and 1 open-pollinated strain of sweet corn. The yield data for 5 plats were lost, and a method of estimation for these missing plats is given. The correlation coefficient for error exceeds the 1-percent level, and an equation is given by which it is possible to adjust the yields on stand for each of the 108 plats. A short method of deriving an analysis of variance for adjusted yields without the necessity of actually adjusting individual plat yields is presented. That this method is mathematically correct is substantiated by the derivation of essentially identical analyses of variance by both methods. The efficiency was increased by adjusting yields. Another example is presented of corn planted in a 10×10 Latin square in which there was a significant residual correlation between yield and stand. The efficiency of the experiment, however, was not increased by adjustment of yield on stand in this case. In a fertility experiment with tomatoes grown from transplants treatment variance and the correlation coefficient between yield and stand were not significant, yet the efficiency gained in adjusting yield on stand is indicated when the adjusted treatment means are compared with the check (no treatment). Additional data from a fertilizer placement test with Refugee beans, however, showed that the value of *F* for yields was not significant after adjusting for stand.

Influence of moisture and low temperature on the germination of hop seeds, D. C. Smith. (U. S. D. A. and Oreg. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 5, pp. 369–381*).—Of various treatments tested at Corvallis, Oreg., as a means of stimulating the germination of hop seeds, that which provided 5 days' incubation in a standard germination chamber followed by 5 weeks' refrigeration at 5° C. (41° F.) resulted in the highest germination. While germinability was often below 10 percent in untreated lots, percentages as high as 80 were attained in the treated series. Varietal differences in reaction to temperature and moisture treatments were not established. Individual seedling plants varied markedly with respect to the germinability of their seed. No difference attributable to treatment was noted in vigor of the seedlings. Under open field conditions climatic factors are believed to overcome dormancy.

Longevity of onion seed in relation to storage conditions, J. H. Beattie and V. R. Boswell (*U. S. Dept. Agr. Circ. 512 (1939), pp. 23*).—Stating that under ordinary handling onion seed is one of the shortest-lived kinds among common vegetables, the authors discuss the results of storage experiments, in part previously noted (E. S. R., 80, p. 484), in which various temperatures, relative humidities, and types of containers were used. Seeds sealed with low moisture content and stored at 20° F. maintained their viability without significant loss over a 9-yr. period. High moisture and temperature were harmful, particularly so when both occurred at the same time. It is recommended that for the maintenance of viability onion seed be reduced to a moisture content of not over 6 percent and stored in sealed containers held at 40° or lower. The superiority of seed of initially high visability was indicated in the fact that such seed held up the best during the tests.

Problems in growing tomatoes in Illinois, W. A. Huelsen (*Illinois Sta. Circ. 491 (1939), pp. 48, fig. 1*).—General information is presented on ecological conditions influencing tomato growing in Illinois; fertility requirements;

preparation of the soil; raising, handling, and setting plants; cultivation; irrigation; staking and pruning; harvesting and grading; and suitable varieties.

One and a half tons of tomatoes from fertilizer costing 48 cents, C. B. Sayre (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 2, pp. 1, 5*).—Under comparable conditions as to general field fertilization and management, the application per plant at time of setting in the field of 1 pt. of water in which were dissolved fertilizing materials containing N, P, and K resulted in materially larger early and total yields than were secured with water alone. It is believed that the "starter" solution supplied available nutrients at a critical stage, permitting the plant to quickly reestablish itself and resume vigorous development. P was indicated as the most important nutrient factor.

[Pomological investigations by the New York State Station] (*New York State Sta. Rpt. 1938, pp. 25–27, 28, 29*).—Included are general progress comments on the following studies: Fruit breeding; use of colchicine for producing polyploidy in flowers and fruits; rootstocks for plums and cherries; soil management of orchards; nutrient needs of the strawberry and blueberry; fertilizers for apple orchards in the Hudson River Valley; grape culture, propagation, and pruning at Fredonia; testing of dwarfing rootstocks for the apple; rootstocks for the sweet cherry; developmental morphology of stone and pome fruits; testing of hop varieties; and the breeding of ornamental crab apples.

Some experimental findings of interest to fruit growers, F. L. Overley and E. L. Overholser. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc., 34* (*1938*), *pp. 113–122*).—This is a general résumé of experimental findings, for the most part previously reported.

Orchard soil management: Some effects of different practices on the soil, N. J. Shaulis and F. G. Merkle (*Pennsylvania Sta. Bul. 373* (*1939*), *pp.* [*2*]+*26, figs. 5*).—Studies of soil collected from selected orchard blocks under clean cultivation, cover crops, and sod, as well as from nearby fields, forests, and fence rows, indicated that the various systems of management had brought about measurable differences in C, N, and volume weight of the soils. The depth of the topsoil was definitely affected by the method of handling. Sod culture was definitely superior, as far as fertility was concerned, to either clean cultivation or the use of annual cover crops. In fact, the use of sods increased the total N content above that of forest soil. The growing of nonleguminous covers did not maintain the total N, organic C, or volume weight as well as under forest conditions, but did, when properly managed, maintain the orchard soil. The low volume weight and associated high porosity and high permeability of orchard soils was maintained by leguminous covers and by grass sods. Clean cultivation without cover crops was found to be a soil-depleting system attended by large losses of organic C and total N. Clean culture caused great damage to the soil structure in its capacity to retain water. Clean culture must eventually lead to the premature abandonment of the orchard. Sod-forming covers, either permanent or occasionally torn up, are conceded the most satisfactory means of maintaining the fundamental soil qualities that lead to sustained productivity.

Fruit tree response as affected by fertilizer and minor element deficiencies, E. L. Overholser, F. L. Overley, L. B. Wooton, and J. B. Rogers. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc., 34* (*1938*), *pp. 73–87*).—In connection with this analysis of the fruit tree nutrition situation, certain data are incorporated. Where soil samples were collected near fruit trees, 6 ft. distant, and midway between the trees, the soil near the trunk was found slightly more acid than that farther away. Organic-matter content varied with

the soil type and in any one soil tended to decrease with depth. Favorable results were secured from the use of B, either as an injection or as a soil application for the control of cork spot, hard end, and black end of Anjou pears. There was indication that cork spot may be the result of a deficiency of both Cu and B.

The tolerance of various orchard cover crops to arsenical toxicity in the soil, O. M. Morris. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc., 34 (1938), pp. 110–112*).—In this preliminary report comments are presented on the behavior of various legumes, grasses, grains, and weeds growing in soil with a high arsenic content.

Fertilization of apple and prune orchards in Idaho, L. R. Tucker (*Idaho Sta. Bul. 226 (1938), pp. 12*).—In experiments extending over a 5-yr. period, no significant benefit to apple trees was observed from the application of N, P, or K, either singly or in combination. Ammonium sulfate applied to Italian prunes in the Boise Valley increased yields an average of 52 percent over a 6-yr. period as compared with adjacent unfertilized trees. The yield increments were accompanied by a material increase in both trunk and twig growth. Applications of 1 lb. per tree were nearly as effective as larger applications up to 6 lb. per tree. In the Payette Valley ammonium sulfate increased the yields of Italian prunes about 18 percent over the unfertilized checks, but there was no conclusive evidence of benefit from either P or K although K may have slightly increased the yields. None of the fertilizer treatments had any apparent effect on the quality of the fruit of either the apple or prune. The author concludes that the use of commercial fertilizers in southern Idaho prune and apple orchards should be restricted to those orchards in which preliminary tests show definite responses.

The water conductivity of the graft union in apple trees, with special reference to Malling rootstock No. IX, L. G. G. Warne and J. Raby (*Jour. Pomol. and Hort. Sci., 16 (1939), No. 4, pp. 389–399*).—Observations on the water conductivity of the graft union in a number of apple trees, both single- and double-worked, indicated that the union introduces an additional resistance to the flow of water in the trees. This resistance was greatest when the dwarfing stock Malling IX was used. The extent to which the union influences the water economy of the tree could only be conjectured, but certain growth characters of trees on Malling IX stock, namely, small leaves, short internodes, and early cessation of growth extension are characters which might be expected in the presence of inadequate water.

A practicable method of top-working large apple trees, F. C. Bradford and H. A. Cardinell (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 184–191, figs. 7*).—Herein is discussed a modified method of inlay grafting which was found effective in top-working apple trees.

The morphology of the apple flower.—II, The use of flower characters in varietal description [trans. title], G. Krumbholz (*Gartenbauwissenschaft, 13 (1939), No. 1, pp. 1–65, figs. 31*).—In this second contribution (E. S. R., 75, p. 48), the author discusses certain flower characters, such as the form of the calyx leaves, relative pistil lengths, pubescence, and the degree of coalescence of the pistil branches and the form of the stigma, all of which were found sufficiently distinct to serve as a basis for varietal classification. In fact, floral characters were found as good as, if not better than, leaves and fruits for varietal identification. In triploid apples the form of the petal was strikingly, if not exclusively, heart-shaped.

Time of picking the Kendall apple, G. H. Howe (*Farm Res.* [*New York State Sta.*], *5 (1939), No. 2, pp. 2, 4*).—Observations on Kendall apples harvested at 10-day intervals indicated that greenness of the flesh disappeared

as maturity advanced. The results suggested that care should be exercised not to pick this variety too early.

The quantity of ethylene present in apples, R. C. NELSON. (Minn. Expt. Sta.). (*Plant Physiol., 12 (1937), No. 4, pp. 1004, 1005, fig. 1*).—A method for the determination of ethylene in plant tissue is briefly described, and the results of preliminary determinations on the tissue of McIntosh apples are given. Fruits after 9 mo. of storage showed an ethylene content of the order of 0.12 mg. per kilogram of fresh tissue.

The determination of ethylene evolved by apples and pears, B. E. CHRISTENSEN, E. HANSEN, V. H. CHELDELIN, and J. B. STARK. (Oreg. State Col.). (*Science, 89 (1939), No. 2310, pp. 319–321, figs. 3*).—A method applicable to small lots of fruit is described and compared with existing procedures.

The pollination of the pear on Vancouver Island, British Columbia, E. R. HALL (*Sci. Agr., 19 (1939), No. 6, pp. 358–371, figs. 4*).—Blooming records presented for fifty-odd varieties of pears show that except for the earliest and latest there was adequate overlapping to provide opportunity for cross-pollination. A marked degree of self-incompatibility was shown in most varieties, 20 failing to mature any fruit upon selfing. June drop was greater in self- than in cross-pollinated fruits. Successful combinations are suggested, with the comment that Bartlett was an effective pollenizer for many other varieties.

Studies on pollen tube growth in Prunus, B. ROY (*Jour. Pomol. and Hort. Sci., 16 (1939), No. 4, pp. 320–328, pl. 1, fig. 1*).—Treatment of the styles of the self-incompatible Noir de Schmidt cherry with phenylacetic acid had no accelerative effect on pollen tube growth or fruit development. Neither naphtholacetic nor indoleacetic acid had any effect on the setting or development of fruit. In the self-incompatible Coe Golden Drop plum, self-pollination was followed by arrested tube development in the stylar tissue. In cross-pollinations of compatible varieties of plum, some of the pollen tubes failed to reach the ovary and exhibited swollen tips, thus suggesting the presence of two pollen genotypes. In reciprocal crosses between the Victoria plum (*P. domestica*), a hexaploid, and the Pissardi (*P. divaricata*), a diploid, it was found that the rate of growth of diploid pollen tubes in a hexaploid style is much more rapid than vice versa.

Studies on some factors relating to hardiness in the strawberry (*Minnesota Sta. Tech. Bul. 135 (1939), pp. 36, pls. 2, figs. 4*).—This bulletin is presented in three parts, the first of which, by E. Angelo, deals with the development of cold resistance in strawberry varieties and indicates that plants dug and potted in November and then held in a greenhouse at about 20° C. (68° F.) may be hardened by placement in a freezing chamber at 0° to withstand freezing at −5°. After hardening for 10 days at 0°, strawberry plants were killed when the temperature reached about −10°. More than 7 days at 0° did not increase hardiness. Although constant exposure at 20° did not harden plants, daily alternation of 12 hr. at 0° and 12 hr. at 20° provided greater hardiness than continuous 0°, provided the 12 hr. at 0° immediately preceded the test. Varieties differed greatly in their hardening capacity. Plants watered abundantly were less hardy than those watered sparingly. Placement of runners in sucrose solution had no evident effect on hardiness. The amount of browning in the medulla was an indication of the degree of freezing injury.

Part 2, by V. E. Iverson, on winter soil temperature as a factor in the environment of the strawberry and some other herbaceous plants, records the temperature of the air and of the soil at different depths under various types of ground covers. It was found that the physical state of the cover is more

important than the material itself. For example, when peat became wet, packed, and frozen, it lost most of its effectiveness. Of several mulches tested, one consisting of mixed leaves appeared most effective because it was least affected by physical conditions. Whereas loose snow proved an excellent protection, ice had little value, and when present in organic materials greatly reduced their effectiveness. Beneath ice, soil temperatures attained a temperature below the safety point for strawberries.

Part 3, by W. G. Brierley and R. H. Landon, on the respiratory rate of dormant strawberry plants, was presented in condensed form in an earlier paper (E. S. R., 80, p. 346).

The relative importance of various factors influencing profits in strawberry production, N. D. PEACOCK (*Michigan Sta. Tech. Bul. 162 (1939), pp. 75*).—Based on an analysis of production records obtained from commercial growers and upon correlated field trials, the conclusion is drawn that profits depend upon three general factors, namely, cost of production, yields per acre, and selling prices. In the first bearing season, cost of production represents nearly half the total cost. In the second season, harvesting and handling the crop accounted for three-fourths of the outlay. The various items of the producing costs are evaluated. Strawberry yields were found dependent upon several factors, none of which was predominant under all conditions. Character of the soil was of primary importance in most cases, with a sandy or gravelly loam in good physical condition considered ideal. Cultivation was highly important, especially during the first growing season. Fertilizers proved of doubtful value on good soils and in such instances may fail to return a profit. Stand of plants in the matted row was found one of the most important factors effecting yields, with total production increasing until eight or nine plants per square foot were reached. Beyond that point total yields and proportion of large fruits may decline. Under the conditions of the test, five or six plants per square foot produced the most profitable yields. The relation of climate to strawberry growing is discussed.

Handling and shipping strawberries without refrigeration, D. F. FISHER and J. M. LUTZ (*U. S. Dept. Agr. Circ. 515 (1939), pp. 16, figs. 9*).—Based on studies of Maryland and North Carolina strawberries shipped by motor truck and express without refrigeration, it was found that timing and care in picking were important factors in relation to shipping quality. Harvesting in the early morning and at frequent intervals, generally at least every other day, was found desirable. Careful picking, which included clean picking and the selection of berries before they reached the full-ripe stage, favored successful shipment. Picking care that eliminated the need of repacking was helpful. Facing the berries or the use of cellophane covers had no apparent benefit on shipping quality but did give a better appearing product. The amount of decay was closely correlated with temperature, especially when above 40° F. The redesign of shipping crates to cause less crushing and cutting of the berries is recommended.

The effect of lead arsenate and copper carbonate sprays on the quality of oranges, R. H. MARLOTH and F. J. STOFBERG (*Jour. Pomol. and Hort. Sci., 16 (1939), No. 4, pp. 329–345, fig. 1*).—Lead arsenate applied at the rate of 1 oz. per large Washington Navel orange tree caused a slight increase in the soluble solids: acid ratio in the juice of the fruit. At the rate of 5 oz. per tree, there was a marked reduction in acid. There was a residual effect on the succeeding two crops. In fact, the reduction in acid was greater in the first succeeding crop than in the year of application Arsenate of lead had no noticeable effect on the total soluble solids in the juice, and the arsenic content of

the juice of lead arsenate sprayed fruits was negligible. Copper carbonate produced no effect on either the total soluble solids or the acid content of the juice but did accelerate coloring slightly. There was no increase in lead or copper in the juice of the sprayed fruits.

A new palm from Costa Rica, Astrocaryum alatum, H. F. Loomis. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 4, pp. 141–146, figs. 2*).—*A. alatum* n. sp. is described. Though too soon to be certain it will survive and become a part of Florida's subtropical horticulture, it is deemed promising.

The horticultural hibiscus in Ceylon, T. H. Parsons (*Ceylon Dept. Agr. Bul. 93 (1938), pp. 6, pls. 5*).—Brief descriptive accounts accompanied by colored illustrations are presented.

The garden of larkspurs, L. H. Bailey (*New York: Macmillan Co., 1939, pp. VIII+116, pls. 25*).—This includes general information on culture, breeding, and botany. The chapter on diseases was prepared by L. H. Leonian of the West Virginia Experiment Station and that on insects by W. E. Blauvelt of Cornell University.

Notes on orchid cultivation and on some orchids cultivated in Ceylon (*Ceylon Dept. Agr. Bul. 94 (1938), pp. [1]+35, pls. 35*).—Information is offered as to culture and varieties.

Germination and growth of some rock garden plants, E. M. Schroeder and L. V. Barton (*Contrib. Boyce Thompson Inst., 10 (1939), No. 2, pp. 235–255*).—The results of studies with seeds of 17 species of plants are discussed. Light was shown in certain species to exert a profound effect on germination. *Primula obconica* and *Ramondia pyrenaica* seeds required light for germination, and in the case of 4 other species exposure to light permitted germination at temperatures ordinarily prohibitive.

FORESTRY

Shelterbelts: The advantages of porous soils for trees, J. H. Stoeckeler and C. G. Bates. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 3, pp. 205–221, figs. 4*).—Moisture determinations of soil samples collected in western Oklahoma in June and July 1935 to a depth of 8 ft. from beneath various covers, such as native grass, scrub oak, and cultivated crops, showed a generally greater amount of free water in the loamy sand and sandy loam than in the finer soil types. The amount of the total water in the fine-textured soils was higher but was less available because of the relatively high hygroscopic coefficients. There was less free water in grassland and under trees than in most croplands. Fallow land showed the highest everage amount of free water. Storage of moisture occurred in larger measure and at a greater depth in the sandy soils than in the fine-textured soils.

Storage of elm seeds, L. V. Barton (*Contrib. Boyce Thompson Inst., 10 (1939), No. 2, pp. 221–233, figs. 3*).—Elm seeds germinated well in moist granulated peat moss at controlled constant temperatures of 15°, 20°, and 25° C., or at daily alternating temperatures of from 10° to 20°, 10° to 25°, 10° to 30°, and from 15° to 30°. For germination in soil in the greenhouse, presoaking in water for 24 hr., as well as pretreatment in moist granulated peat moss at 5° for 1 mo., greatly increased germination. Seeds of a moisture content of 7 percent were superior in viability to those of 8-percent content after storage in sealed containers at room temperatures. An atmosphere of oxygen proved especially harmful when both moisture content and storage temperature were relatively high. A vacuum served to prolong viability when other storage conditions were unfavorable. Elm seeds were kept viable for at least 16 mo. when held in sealed containers kept at 5° or below.

The production of certified holly in Maryland, N. H. Fritz (*Jour. Forestry, 37 (1939), No. 3, pp. 236–238, fig. 1*).—A method of cutting is described in which the tree is carefully pruned so that crops may be secured every other year without ruining the tree.

Persistence of stems per sprout clump in oak coppice stands of southern New Jersey, O. M. Wood. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 3, pp. 269, 270*).—Despite the fact that of several species post oak had the greatest relative number of one-stem clumps, its low growth rate offset this advantage. On the other hand, the rapid growth rate of scarlet oak rendered it a potentially valuable species despite its tendency to develop a large number of stems per clump.

The growth and nutrition of white pine (Pinus strobus L.) seedlings in cultures with varying nitrogen, phosphorus, potassium, and calcium, with observations on the relation of seed weight to seedling yield, H. L. Mitchell (*Black Rock Forest Bul. 9 (1939), pp. VI+135, pls. 4, figs. 22*).—Plants grown from seed taken from a single tree and cultured for 108 days in sand, the N, P, K, and Ca contents of which were varied individually, showed under the conditions of the experiment that seedling dry weights were proportional to individual variations in the external supplies of the four elements. In each case a maximum was reached, beyond which further increases resulted in decrements. The responses of seedlings were greater to N, particularly to K and Ca, than to equal increments of P. The root: shoot ratios of the seedlings in the N series tended to vary inversely as the N supply over the greater part of the range studied. Seedlings grown in properly balanced nutrient-sand cultures were far superior, as regards total weight, balance between root and shoot, and, to a lesser degree, root development, than the average nursery-grown seedling of the same age. Results of chemical analyses revealed an exceedingly high correlation between internal content of the four elements and the concentration of the respective elements in the solution. For each element there was indicated an optimum internal concentration through which the seedlings approached or attained maximum growth. It is suggested that the ideal nutrient environment is one so adjusted as to maintain within the seedling a constant and approximately optimal internal concentration. The necessity of using seed of similar initial weight in such critical studies was indicated.

The relationships between cumulative solar radiation and the dry weight increase of nursery-grown white pine and red pine seedlings, H. L. Mitchell, and R. O. Rosendahl (*Black Rock Forest Papers, 1 (1939), No. 13, pp. 87–93, figs. 2*).—In 1936 red pine and white pine seedlings were exposed to radiation intensities of 30, 57, 78, and 100 percent of full sunlight secured by means of brass wire cloth screens of different transmission capacities. The total yields (roots and shoots) increased with increasing solar radiation over the total range employed. It was evident that response to increments above 50 percent of full sunlight was less than to increments below this point. Evidence is presented that the root: shoot ratios and the yields of seedlings grown in different years in the same locality may be influenced by climatic factors which change the quality of solar radiation by altering the ratio of infrared to visible radiation. Seedlings grown during a sunny summer in a soil of high fertility may actually be smaller than those grown during a relatively cloudy summer in a soil of lower fertility.

Development of branches and knots in western white pine, E. F. Rapraeger. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 3, pp. 239–245, figs. 5*).—Sections obtained by sawing the portion of the tree between the ground line and the live crown were carefully examined as to the character and habit of

growth of the branches and resulting knots. Branches originated at the pith, and their length of life was strongly influenced by light conditions. Branches higher up on the tree tended to be larger because of their longer life. After death, branches persisted for many years—so long that the author believes that very little clear lumber can be produced naturally unless the rotations exceed 120 yr. The possibility of pruning dead and useless lower limbs to hasten occlusion is discussed.

Profitable utilization of white pine thinnings, W. C. SECHRIST (*Jour. Forestry, 37 (1939), No. 3, pp. 232–235*).—Stating that in the State and privately owned forests of Pennsylvania there are many acres of pine plantations in need of thinning, the author discusses the results of a thinning project in the Mont Alto State Forest in which an attempt was made to utilize profitably trees from 6 to 9 in. in diameter for shingles and boxboards.

Pine in the diet of white-tailed deer, S. E. ALDOUS. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 3, pp. 265–267, figs. 2*).—Observations in the Superior National Forest, Minn., showed that although all native species of pine are browsed in the fall months, jack pine is preferred at that season. Few trees were killed by browsing but many were much deformed and retarded. Because of the increasing importance of jack pine as a source of wood pulp, deer injury becomes a matter of significance to foresters.

Torrey pine, L. O. HUNT. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 3, pp. 267, 268*).—There were found to be from 416 to 512 seeds per pound, containing approximately 70 percent of sound seed. Torrey pine is said to grow well under adverse moisture conditions but probably does not possess resistance to frost.

The anatomy of spruce needles, H. F. MARCO. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 5, pp. 357–368, pls. 7*).—Studies of cross and longitudinal sections of *Picea* spp. needles revealed new anatomical features not heretofore recognized. Epidermal cells were found to be equipped with teeth projecting into the cuticle and locked to one another by a modified dovetailed joint. Since libriform hypodermal fibers overlap, the variation in the size of the lumina is not considered of diagnostic value. The thickened upper and lower guard-cell walls near the stoma were separated by two extremely thin, flexible membranes which collapsed when the stomata were opened, bringing the two guard-cell walls in contact. With none, one, or two resin ducts or cysts in any given spruce needle cross section, their number is not of diagnostic value, but their diameters are constant within certain limits and may be used in identification. The number of strengthening or fibrous cells adjacent to the bundles is deemed an important distinguishing characteristic. Detailed anatomical descriptions are given for mesophyll, endodermal, and transfusion cells and for fibrovascular bundles. The function of all tissues is also described.

Ohio Forest News, [March 1939] (*Ohio Forest News [Ohio Sta.], No. 35 (1939), pp. 12, figs. 2*).—This pamphlet of general information (E. S. R., 79, p. 632) includes articles on handling of forest products from a catalpa plantation and the silvicultural and marketing requirements of ash.

DISEASES OF PLANTS

The Plant Disease Reporter, April 1 and 15, 1939 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 23 (1939), Nos. 6, pp. 91–114, figs. 6; 7, pp. 115–128, figs. 2*).—The following items are included:

No. 6.—Dutch elm disease in the United States, 1930 to 1938 (with maps); the disease of pines caused by *Sphaeropsis ellisi*, by A. M. Waterman; tuber diagnosis of bacterial ring rot of potatoes, by J. G. Leach; maturity of asco-

spores of the apple scab fungus; some reports on the early appearance of lea rust and powdery mildew of wheat and barley, and the overwintering of lea rust in southern and central Plains States; notes on clover plants affected b stem rot (*Sclerotinia trifoliorum*) and sweetpotatoes, tobacco, and clovers in fested by root knot nematodes (*Heterodera marioni*) in Virginia; fifth experi mental forecast (for 1939) of the incidence of bacterial wilt of sweet corn, b N. E. Stevens and C. M. Haenseler; the occurrence in an Ohio glasshouse grown crop of tomatoes of a disease thought to be Australian "spotted wilt," by L. J. Alexander and S. P. Doolittle; occurrence of curly top in the Pacifi Northwest in 1938, by B. F. Dana; and further reports on tobacco down mildew for North Carolina, South Carolina, and Georgia.

No. 7.—New records of *Elsinoë* and *Sphaceloma* species in the United State by A. E. Jenkins; hop anthracnose, by G. R. Hoerner; bacterial ring rot o potatoes in California, by P. A. Ark; northwestern anthracnose of appl reported from Massachusetts, by O. C. Boyd; pine tip dieback in Nebraska, b F. R. Lancaster; and brief notes on wheat diseases in Oklahoma, apple sca in New York, and cedar rusts in Oklahoma.

Abstracts of papers [on plant diseases] (*Northwest Assoc. Hort., Ent., an Plant Path., Moscow, Idaho, 4 (1938), Abs. Papers, pp. 1–3, 5, 6, 13–15*).—The fol lowing are of interest to phytopathology: The Response of Fruit Trees i Washington to Certain Minor Elements, by E. L. Overholser (Wash. Expt Sta.); The Boron Deficiency Symptoms on Agricultural Plants in Britis Columbia, by H. R. McLarty and R. E. Fitzpatrick; A Method of Detectin Boron-Deficient Soils and the Occurrence of Such Deficiencies in Idaho, b W. E. Colwell (Idaho); Zinc Treatments for Little Leaf, by O. T. McWhorter and Pea Seed Treatments in Relation to Germination, by A. G. B. Bouque (both Oreg.); Control of Snapdragon Rust, by W. R. Foster; Development o Curly Top Resistance in Beans, by D. M. Murphy (Idaho); Wood Decay o Crowns and Roots of Raspberry Plants, by W. Jones; Blister Rust Control i the Inland Empire, by H. E. Swanson, and Comparative Study of the Apple Tree Anthracnose and Perennial-Canker Fungi, by J. R. Kienholz (bot U. S. D. A.); and The Fruit Disease Situation in Idaho, by E. C. Blodget (Idaho).

[Plant disease studies by the California Station] (*California Sta. [Bien.] Rpt. 1937–38, pp. 16, 20, 21, 22, 23, 24, 33, 34, 35–47, fig. 1*).—Brief reports o progress are given on studies relating to protection against a new soil-borne variety of wheat smut in the West; development of onion strains resistant to downy mildew and to pink root; breeding peaches resistant to mosaic and to delayed foliation; boron injury to deciduous fruit trees, including plum, apri cot, peach, pear, almond, and walnut; prune dieback; psorosis (virus) of citrus trees; granulation of Valencia oranges; control of citrus fruit rots and molds by sprays, washes, and sanitation; water spot of citrus; problems in avocado culture, including the relation of chlorine to ring-neck and to defoliation and severe tipburn; the spread of date decline due to *Omphalia* spp.; control of date spoilage and of fig smut and mold; California vine disease (virus?) and red leaf of grapes (possible control by selenium sprays); bac terial canker of stone-fruit trees; Kelsey spot of plums; chilling requirements for satisfactory opening of deciduous-fruit tree buds and the relation of warm winters to shedding of unswollen fruit buds; soil injections of CS_2 for oak root fungus; control of brown rot blossom blight of stone fruits by eradi cant sprays; control of carrot blight (*Cercospora* and *Macrosporium*); spray ing for onion mildew; tomato bacterial canker; controlling hop mildew; new information on flower diseases, including bacterial bud rot and blight of lark-

spur, snapdragon rust, *Phoma* stem canker of gardenias, and bacterial blight of garden stock; control of southern root rot of beets; and sugar beet seed treatment for damping-off (*Pythium*, *Rhizoctonia*, and *Phoma*).

Department of plant pathology (*Delaware Sta. Bul. 214 (1938), pp. 29–45, figs. 3*).—Reports of progress are given on studies of the dissemination of peach yellows and little peach and factors in their control, by T. F. Manns; control of sweetpotato wilt (*Fusarium batatatis*) by chemical treatments, by Manns and J. W. Heuberger; breeding and selection of tomatoes resistant to disease, and tomato foot rot (black shank, collar rot, and early blight due to *Macrosporium solani*), both by Manns; spray materials and dusting work on apple, by Manns, J. F. Adams, and Heuberger; bacterial spot of stone fruits, by Manns, Heuberger, and S. L. Hopperstead; plant disease surveys, by Manns; spray injury, by K. J. Kadow and M. W. Goodwin; tests of new spray materials and dusts, by Kadow and Hopperstead; and cucurbit scab or pox (*Cladosporium cucumerinum*), and control of tomato early blight (*M. solani*), both by Kadow.

[**Phytopathological studies by the Florida Station**] (*Florida Sta. Rpt. 1938, pp. 74, 75, 80, 83, 109–127, 128, 137–140, 145, 146, 147, 148, 163–169, 175, 176, 181, 182, 185, 186, 190–193, figs. 3*).—Brief reports are presented by various station and substation workers (R. M. Barnette, R. W. Ruprecht, H. E. Bratley, A. N. Brooks, A. F. Camp, A. H. Eddins, B. R. Fudge, C. C. Goff, L. O. Gratz, D. G. A. Kelbert, R. R. Kincaid, W. A. Kuntz, K. W. Loucks, W. Reuther, A. S. Rhoads, G. D. Ruehle, W. B. Shippy, W. B. Tisdale, G. R. Townsend, R. K. Voorhees, M. N. Walker, J. R. Watson, G. F. Weber, and E. West) on the following studies: "Chlorosis" in corn and other field crop plants; blackheart of celery; root knot; disease control in potatoes, including bacterial wilt and soft rot, net-necrosis and leaf roll, rugose mosaic, scab, and seedling cross and variety tests in relation to disease resistance and local adaptability; control of brown rot (*Bacterium* (=*Phytomonas*) *solanacearum*) of potatoes and closely related crops; comparison of *Diplodia* forms resembling *D. frumenti*; study and control of *Fusarium niveum* wilt and other diseases of watermelons; control of *Fusarium lycopersici* wilt of tomatoes in Florida; *Clitocybe tabescens* and other root rot fungi of citrus and other woody plants in Florida; factors in the decay of citrus fruits; a bark disease of Tahiti lime trees; fruit rots of grapes; host relations and factors influencing the growth and parasitism of *Sclerotium rolfsii*, a hitherto unreported disease—web blight (*Rhizoctonia microsclerotia?*)—of beans in Florida; the comparative pathogenicity and taxonomy of species of *Alternaria*, *Macrosporium*, and *Stemphylium*; control of *Rhizoctonia* disease of potatoes and vegetable crops; *Sclerotinia sclerotiorum* pink rot of celery; control of pink rot and early blight of celery; gummosis and psorosis of citrus trees; witches'-broom disease of oleander; downy mildew-resistant cucumber and cantaloup for Florida; palm diseases on Key West; relation of fungi and environal factors to failure of centipede grass; control demonstrations with tobacco downy mildew; citrus dieback; citrus scab and its control; melanose and stem-end rots of citrus fruits; the effect of zinc, manganese, and other unusual mineral supplements (Mn, Mg, Cu) on the growth of citrus; seed- and soil-borne diseases of vegetable crops, including seed-piece decay, mosaic, and scab of potatoes, halo blight of beans, seed decay in lima beans, seed and seedling rots of peas, root and stem rots of beans, and damping-off of celery seedlings; and leaf blights of vegetable crops, including bean rust, bean spraying and dusting tests, early blight of celery, lima bean spraying and dusting with special reference to copper injury to the foliage following insect injury, pea spraying and dusting,

downy mildew of peas, early and late blights of potatoes, and nailhead leaf spot of tomatoes; field and laboratory studies of tobacco diseases; algal leaf spot (*Cephaleuros*) of guava and *Alternaria* blight of *Dichondra caroliniensis;* control of potato diseases in Dade County, including early blight, scab, and *Rhizoctonia*, and spindling sprout; diseases of avocados and mangoes and development of control measures, and control of tomato diseases by spraying.

[Phytopathology at the New York State Station] (*New York State Sta. Rpt. 1938, pp. 22–24, 32*).—Progress reports are given on fruit disease investigations, including the control of apple scab, cherry leaf spot, and raspberry mosaic and spur blight; control of cabbage yellows by resistant varieties; *Fusarium* diseases of plants; red copper oxide as a foliage fungicide and its use in controlling various diseases, including damping-off of peas; hop downy mildew control by copper and zinc sprays; seed treatment of potatoes with yellow oxide of mercury for scab; breeding cauliflower resistant to black rot; the cause of poor stands of lima beans on Long Island; and seed-borne microorganisms and their control, including those affecting pea, bean, corn, barley, oats, and celery, and trials of various seed protectants (mercuric chloride and ethyl mercuric phosphate proving efficient).

[Phytopathology at the Washington Station]. (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 368 (1938), pp. 12–14, 55, 59–67*).—Brief reports are given on current work relating to the resistance of wheat to bunt and other diseases and inheritance in cereals, by E. F. Gaines, O. A. Vogel, and K. Wade; bitter pit and related diseases of pears, by E. L. Overholser, F. L. Overley, J. B. Rogers, and L. B. Wooton; wheat smut and oat smuts, both by C. S. Holton, F. D. Heald, and Gaines; etiology and control of apple rots, and etiology and prevention of alfalfa failures, both by Heald and R. Wellman; pear rots, by Heald and H. English; forage grass diseases, by G. W. Fischer; etiology and control of sugar beet diseases, including black root, crown rot, and a root disease, and bean rust, both by L. Campbell; virus and other diseases of potato and other solanaceous plants, by L. K. Jones; virus diseases of peas, by Jones and F. Johnson; diseases of glasshouse plants, including geranium and carnation, and virus diseases of brambles, both by Jones; downy and powdery mildews of peas, by Jones and Campbell; and a summary of a plant disease survey for the season, by Heald, Jones, and G. A. Huber.

Proposed additions to etiological terminology, J. Ehrlich. (Univ. Idaho). (*Phytopathology, 29 (1939), No. 5, pp. 459, 460*).—The author proposes the terms "saprogen," "saprogenic," and "saprogenicity," referring particularly to wood decay.

The nomenclature of plant viruses, C. W. Bennett. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 5, pp. 422–430*).—This is a general discussion of classification methods and nomenclatorial systems proposed for use with plant viruses.

Proposal for extension of the binomial system of nomenclature to include viruses, F. O. Holmes (*Phytopathology, 29 (1939), No. 5, pp. 431–436*).—The desirability of a Latin binomial system for viruses to replace the current numerical systems is discussed, together with an illustrative classification of the plant viruses.

Some recent work on plant viruses, F. C. Bawden (*Empire Jour. Expt. Agr., 7 (1939), No. 25, pp. 1–10*).—A critical review on the nature of viruses, symptoms of virus diseases, vectors, control, viruses as antigens, and chemical nature and isolation.

Causes of virus diseases in plants, M. T. COOK. (P. R. Col. Expt. Sta.). (*Sci. Mo., 48 (1939), No. 4, pp. 357–361*).—This is a brief review of theories as to the nature of the viruses causing plant diseases, from the time of Mayer's early publication (1882) on tobacco mosaic to the present time.

Chemistry of the plant viruses, A. S. MCFARLANE (*Biol. Rev. Cambridge Phil. Soc., 14 (1939), No. 2, pp. 223–242, figs. 8*).—This is a critical review.

A note on some protein constituents of normal tobacco and tomato leaves, F. C. BAWDEN and N. W. PIRIE (*Brit. Jour. Expt. Path., 19 (1938), No. 4, pp. 264–267*).—This note deals with the unstable proteins of normal plants, some with molecular weights of the same order as the viruses, which must be removed during the isolation of the viruses.

A list of plant viroses observed in China, T. F. YU (*Phytopathology, 29 (1939), No. 5, pp. 460–462*).—This is an annotated list of virus diseases observed on 35 economic plant species.

A survey of interaction between fungi, H. R. X. D'AETH (*Biol. Rev. Cambridge Phil. Soc., 14 (1939), No. 2, pp. 105–131*).—The literature on interactions among fungi is dispersed and fragmentary, and the author here attempts to survey as far as possible the scattered published results, interactions in the soil, on or in the host plant, and on culture media being considered. The bibliography contains about three pages of references.

A review and extension of our knowledge of Calyptospora goeppertiana Kuehn, J. H. FAULL (*Jour. Arnold Arboretum, 20 (1939), No. 1, pp. 104–113*).—Added to the review of this rust, including its nomenclature and taxonomy, are the results of life history studies and lists of 13 species of *Abies* definitely proved to be hosts of the haploid phase and of 7 species of *Vaccinium* definitely proved and 10 species suspected as hosts of the diploid phase. Knowledge of the geographical distribution of the fungus is extended.

The genera Skierka and Ctenoderma, E. B. MAINS (*Mycologia, 31 (1939), No. 2, pp. 175–190, figs. 14*).—This is a taxonomic study of these two genera of rust fungi (Pucciniaceae), in which four new species of *Skierka* are described. There are 20 literature references.

A bacterium antagonistic to Rhizoctonia solani, T. C. CORDON and C. M. HAENSELER. (N. J. Expt. Stas.). (*Soil Sci., 47 (1939), No, 3, pp. 207–214, pl. 1*).—A rough strain identified as *Bacillus simplex* produced a diffusible, heat-stable substance in media which was growth-inhibitory or lethal to *R. solani*. The toxic principle was adsorbed by activated charcoal and could be partially removed from the latter by hot alcohol. Removal, by precipitation with alcohol or $(NH_4)_2SO_4$, of the major portion of the protein fraction from media made toxic to *R. solani* by the bacterium failed to remove or destroy the toxic principle. Treatment of greenhouse soil infested with the fungus by a potato-dextrose-peptone solution used for growing the bacterium or with living, washed bacterial cells without nutrient medium gave appreciable control of seed decay and damping-off in cucumbers and peas, but the sterile medium alone also gave some control, possibly by favoring saprophytic micro-organisms in the soil. The results of the soil tests were thus not so outstanding as those obtained in the laboratory, but there were indications that the organism used was able to produce under soil conditions a material toxic to this fungus.

New species of Uredinales, G. B. CUMMINS. (Ind. Expt. Sta.). (*Mycologia, 31 (1939), No. 2, pp. 169–174, figs. 6*).—The author describes three new species of *Puccinia*, one of *Uropyxis*, and two of *Uromyces*. A key based on this study gives the differential characters for species of *Uromyces* on Loranthaceae.

Soil-borne fungi and the control of root disease, S. D. Garrett (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 38 (1939), pp. 54*).—This monograph (with a bibliography of over seven pages) considers the role of fungi in the soil, plant sanitation by disposal of infected material and by preventing dispersal of the fungus, elimination of infectious material from the soil (by fungicides, mechanical methods, crop rotation, and biological control), adjustment of soil conditions to check the activity of the parasite, and augmentation of host resistance.

The problem of immunity in plants [trans. title], P. Nobécourt (*Bul. Assoc. Dipl. Microbiol. Faculté Pharm. Nancy, No. 17 (1938), pp. 9–28*).—This is a general summary of the present state of knowledge on natural and acquired immunity.

Disease, damage, and pollination types in "grains," N. E. Stevens. (Univ. Ill.). (*Science, 89 (1939), No. 2311, pp. 339, 340*).—The author examines the available evidence as to whether genetic uniformity will or will not favor the building up of specialized strains of parasites. In doing so he develops a "disease index" based on the volume of the literature and the economic value of the specific crop plants concerned. He concludes: "Any one who is unwilling to accept the significance of a correlation between the striking freedom from disease and the fact that the plant can reproduce only by crossing . . . should at least advance some other hypothesis."

The relation of copper fungicides to lead arsenate-lime and fixed nicotine-oil sprays—1938 results, K. J. Kadow, S. L. Hopperstead, and M. W. Goodwin. (Univ. Del.). (*Peninsula Hort. Soc. [Del.] Trans., 52 (1938), pp. 88–98, fig. 1*).—All the insoluble coppers used with lead arsenate induced less fruit injury and copper leaf burn than bordeaux mixture, but they stuck very poorly to apple fruit and leaves, except for copper phosphate-lime-bentonite which failed in controlling bitter rot and codling moth. This result appears to show that too much inert matter may reduce the value of some sprays. All of the insoluble coppers used with lead arsenate proved inferior to bordeaux in controlling arsenical injury, but a few were commercially satisfactory, viz, oxo-bordeaux, cupro K, copper hydro, and compound A.

None of the coppers could be safely used in Delaware with fixed nicotine and oil without lime, though it is possible that nicotine sprays might be used with lime, and therefore with some of the coppers, if the interval between sprays were shortened. Fixed nicotines greatly increased the solubility of the insoluble coppers (laboratory analyses). All copper fungicides used increased the release of nicotine over that in regular fixed nicotine-oil sprays and seemed also to reduce the original nicotine deposits although the nicotine-oil sprays actually increased the copper residues over the lead-lime series. The pH values of the various copper fungicides alone in water varied greatly in different batches and were not always correlated with actual nicotine release in the field.

It is concluded that "bordeaux still remains the most satisfactory fungicide; one of the most suitable materials for the correction of arsenical injury and one of our few reliable stickers."

Soil fumigation with chemicals, F. L. Howard. (R. I. Expt. Sta.). (*Market Growers Jour., 64 (1939), No. 6, p. 141, figs. 2*).—Successful results are reported on the use of chloropicrin for soil fumigation against fungus and insect pests and weeds, including 2 years' tests with tomatoes, peppers, eggplants, onions, potatoes, mangels, rutabagas, cabbage, buckwheat, corn, millet, and carrots.

New use for World War tear gas: Sterilization of soil and nematode control offers peace time use for chloropicrin, G. H. Godfrey. (Tex. Expt Sta.). (*South. Seedsman, 2 (1939), No. 2, pp. 3, 14, 20, fig. 1*).—This is a semi-popular account summarizing the results of studies by the author (E. S. R., 75,

p. 638) and others leading to successful control of insects in stored products, of nematodes, and of soil fungi and insects by the use of chloropicrin.

Seed certification in Germany [trans. title], K. SNELL (*Chron. Bot., 5 (1939), No. 1, pp. 53, 54*).—This is a discussion of the legal regulation adopted in Germany whereby only certified seed (tested for variety, purity, and condition in respect to disease) is to be allowed in commerce. Certification is to be granted on the basis of field inspection of the plants and also in many cases of further testing of the seed ready for sale. The number of varieties is to be restricted to those considered most desirable. New varieties are to be substituted for less desirable varieties on the governmental variety list only after tests for yield, quality, and disease resistance at scientific institutes. Beginning in 1941 only varieties of potatoes immune to potato wart disease will be permitted to be grown. Only immune varieties may now be certified for seed purposes. The earlier studies were carried out with respect to grain varieties, and not until recent years were other kinds of agricultural plants included.

Seed treatments for cereal crops, W. E. BRENTZEL (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 4, pp. 17–20, figs. 2*).—Directions are given for seed disinfection for the control of seed-borne diseases of wheat, oats, barley, rye, emmer, millet, and corn. The organic mercury dusts are recommended for covered smut and certain blights of wheat, covered smut and stripe of barley, and smuts of oats and millet and covered smut of emmer; and the copper carbonates and basic copper sulfate for covered smut of wheat only.

Recent developments and future trends in cereal-seed treatment, R. J. HASKELL (*U. S. Dept. Agr., Ext. Path. No. 37 (1939), pp. 41–45*).—A summary of recent investigations, with nine references.

Memoir on the immediate cause of bunt or smut of wheat, and of several other diseases of plants, and on preventives of bunt, B. PRÉVOST, trans. by G. W. KEITT (*Phytopath. Classics No. 6 (1939), pp. 95, pls. 3*).—A foreword, biographical sketch, and evaluation of this historically significant memoir by the translator precedes the text, the original of which has "been followed as closely as seemed consistent with rendition in acceptable English."

A chlorotic mottling of wheat leaves caused by infections of bunt Tilletia laevis, C. O. JOHNSTON and C. L. LEFEBVRE. (Kans. Expt. Sta.). (*Phytopathology, 29 (1939), No. 5, pp. 456–458, fig. 1*).—In greenhouse tests bunted wheat (both spring and winter) almost invariably exhibited a yellowish mottling of the leaves, while noninfected plants remained a normal green. By this mottling infected plants could be identified long before heading, but owing to complicating factors the presence of mottling in the field was not as certain an indication.

Results from the uniform bunt nurseries in the western region in 1938, with averages for 1937, C. S. HOLTON and C. A. SUNESON (*U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. 3*).—Seeds were sown in uniform nurseries at 10 locations (1938) to determine the reactions of 27 winter wheat varieties to bunt, other than the "dwarf" race of *Tilletia tritici*, and the data obtained are summarized in two accompanying tables and discussed.

[Leaf and stem rust of wheat], C. O. JOHNSTON (In *Report of the Fourth Hard Red Winter Wheat Improvement Conference. Manhattan, Kans., 1938, pp. 8–14*).—This is a progress report on breeding of wheat for leaf rust resistance, with lists of varieties or named hybrids and promising unnamed hybrids deemed to be the best sources of resistance; and a summary of the reactions of commercial varieties of winter wheat to stem rust (resistant, moderately resistant or tolerant, rust escaping, and susceptible), with a list of hybrid selections having strong resistance.

Revised register of physiologic races of leaf rust of wheat (Puccinia triticina), H. B. HUMPHREY, C. O. JOHNSTON, R. M. CALDWELL, and L. E. COMPTON. (Coop. Ind. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. [1]+18*).—This revision (E. S. R., 77, p. 346) includes all additions and brings the number of recognized races to 105. Tables indicate the reactions of differential varieties of *Triticum vulgare* to these races, and present information on original descriptions and place and year of discovery or report. An analytical key for identification of the races is based on their parasitic behavior on wheat varieties.

Studies on Polymyxa graminis, n. gen. n. sp., a plasmodiophoraceous root parasite of wheat, G. A. LEDINGHAM (*Canad. Jour. Res., 17 (1939), No. 2, Sect. C, pp. 38–51, pls. 5, figs. 3*).—*P. graminis* n. g. and n. sp. is described as parasitizing wheat roots in soil of three Ontario localities. Besides spore clusters of *Ligniera* type, large, septate zoosporangia with conspicuous tubes for zoospore discharge are present. Both resting spores and zoosporangia produce identical zoospores with two flagella of unequal length. The fungus and its life cycle are fully described and its relationship to the Plasmodiophorales is indicated by the form of the resting spore clusters, the method of nuclear division during growth of the myxamoebas, and the characteristic flagellation of the zoospores.

The effect of salicylic aldehyde on the infection of wheat by Pythium arrhenomanes Drechsler, and the destruction of the aldehyde by Actinomyces erythropolis and Penicillium sp., V. E. GRAHAM and L. GREENBERG (*Canad. Jour. Res., 17 (1939), No. 2, Sect. C, pp. 52–56, fig. 1*).—"Salicylic aldehyde, when added to soil at the rate of 50 p. p. m., seems to predispose wheat roots to attack by parasitic strains of *Pythium arrhenomanes*. *A. erythropolis* and a species of *Penicillium* have been found in soil from the healthy area of a field partially infected with Browning root rot. These organisms caused the disappearance of salicylic aldehyde in an artificial medium. It is suggested that lack of activity on the part of such organisms in certain areas of a field may lead to an accumulation of salicylic aldehyde or products acting in a similar manner, and that this may be a predisposing factor in the appearance of Browning root rot caused by *Pythium arrhenomanes*."

[Alfalfa diseases] (*Alfalfa Impr. Conf. Rpt., 6 (1938), pp. 27–31, 34, 35*).—The following brief papers are included: Pathological Problems in Growing Alfalfa, by L. E. Melchers and D. B. Creager; and Alfalfa Wilt and Breeding Nursery at Manhattan, by C. O. Grandfield.

The zinc content of weeds and volunteer grasses and planted land covers, L. H. ROGERS, O. E. GALL, and R. M. BARNETTE. (Fla. Expt. Sta.). (*Soil Sci., 47 (1939), No. 3, pp. 237–243*).—Previous work by others on the beneficial effects of "land resting" and on the use of $ZnSO_4$ to prevent white bud of corn suggested a study of the zinc content of various indigenous and cover crop plants. Samples of 10 weeds and volunteer grasses and of the planted summer cover crops of three crotalarias collected in the fall from plats of a land-resting test on Norfolk and Hernando fine sands were analyzed by a spectrographic procedure for the Zn content of the ash. The dry matter of the weeds from plats rested for 2 yr. averaged 140 p. p. m. of Zn, and that of *Crotalaria spectabilis* planted annually 8 p. p. m. The dry matter of weeds and grasses collected from plats rested for 1 yr. averaged 70 p. p. m. of Zn, and that of the three crotalarias planted in plats in a 2-yr. rotation with corn and peanuts 21 p. p. m. These results appear to show that the weeds and volunteer grasses can absorb much larger proportions of Zn than can the planted land covers and thus apparently make available sufficient Zn to prevent the development of the white bud trouble in corn.

The control of cotton root rot in the Blackland region of Texas, H. E. Rea (*Texas Sta. Bul. 573 (1939), pp. 36*).—General discussions of the methods of spread and perpetuation of *Phymatotrichum omnivorum*, prevention of further spread, and rotation as a method of control are followed by a presentation of the results of rotation studies at the Temple Substation and of the use of control methods other than rotation. The soil, climate, and flora of the Blackland region are said to be particularly favorable to the spread and perpetuation of the fungus. The strand growth spreads and perpetuates infection by continuous growth, chiefly along the live roots of susceptible hosts and from one plant to another where continuous cotton culture is practiced and where susceptible weeds occur. Further spread into uninfested portions of fields may be prevented by a barrier (at least 30 ft. wide) of sorghum between infested and uninfested areas. In the tests reported, marked and consistent control of cotton root rot was secured in rotations of cotton with nonsusceptible crops in which cotton was grown only one-fourth of the time, at least 2 yr. between cotton crops being required. Control of susceptible weeds was found to be a prerequisite to control by rotations. Increased acreages of nonsusceptible crops are frequently needed on the farms of the Blackland area to enable farmers to secure the maximum benefit from rotations for root rot control, and increased incomes from root rot immune crops may usually be secured where sufficient stock water is available by marketing these crops through livestock. Other methods of control are said to be less applicable to this region. Deep tillage requires expensive machinery, soil amendments are seldom effective in the field, commercial fertilizers are most valuable in conjunction with rotations, heavy applications of animal manure have failed to give satisfactory control under dry-land conditions, green manuring practices give uncertain control, and, while resistant cotton varieties may be found, the prospects are not judged as encouraging as are those for the further improvement of immune crops that may be grown in rotations with cotton.

Cottonseed treatment, S. G. Lehman. (N. C. Expt. Sta.). (*U. S. Dept. Agr., Ext. Path. No. 37 (1939), pp. 32–40*).—This is a review of some of the recent work, with a bibliography of 18 titles.

Diseases of potatoes in Idaho, J. M. Raeder (*Idaho Sta. Circ. 80 (1939), pp. 28, figs. 16*).—This compendium presents and illustrates the important available information relating to potato diseases and their control, including the virus, fungus, bacterial, and nonparasitic affections. Special consideration is given to methods of seed treatment.

Scab immunity, D. Reddick. (Cornell Univ.). (*Amer. Potato Jour., 16 (1939), No. 3, pp. 71–74, 76*).—*Solanum commersonii*, *S. chacoense*, *S. caldasii glabrescens*, *S. jamesii*, and an unnamed variety, grown in soil heavily infested by *Actinomyces scabies*, are reported to have given an immune reaction over a 2-yr. period. All are said to have objectionable characters, including late maturity, long stolons, and those of the *S. commersonii* group a bitter flavor. Interspecific hybrids have been obtained, but the usefulness of these species in a breeding program for developing scab-resistant commercial sorts remains to be determined.

Reports and abstracts of papers to be presented at the sixth congress of the International Society of Sugar Cane Technologists, Baton Rouge, Louisiana, October 24, 1938, to November 5, 1938 (*Internatl. Soc. Sugar Cane Technol. Cong. [Baton Rouge, La.] Rpts., 6 (1938), pp. 23–26, 27–29, 31–52, 103, 104*).—Abstracts of the following papers of interest to plant pathology are included: Recent Developments in Sugarcane Pathology, by E. C. Tims (La. State Univ.); Breeding and Testing Sugarcane Seedlings for Mosaic Disease Resistance, and for Gumming Disease Resistance, at the British West

Indies Central Sugar Cane Breeding Station, Barbadoes, both by G. C. Stevenson; Recent Progress in Sugarcane Disease Control in Florida, by B. A. Bourne; Some Recent Findings Regarding Fiji Disease of Sugarcane in the Philippines, and A Review of Sugarcane Diseases in the Philippines, both by G. O. Ocfemia; The Relation of Environmental Factors and Antagonistic Organisms to Root Rot of Sugarcane and Corn, by F. J. LeBeau, and Seed Selection and Roguing in the Practical Control of Mosaic Disease of Sugarcane in Louisiana, by M. L. Shaffer (both La. State Univ.); The Behavior of Mosaic on Certain Soils, and Mosaic in Regard to Cane Breeding, by H. Sorensen; Red Rot of Sugarcane, by E. V. Abbott, and *Pythium* Root Rot of Sugarcane, by R. D. Rands and E. Dopp (both U. S. D. A.); Diseases of the Sugarcane in Brazil, by A. A. Bitancourt; Minor Sugarcane Diseases in Egypt, by A. H. Rosenfeld; On the Red Stripe of Sugarcane in Brazil, by H. V. Silveira Grillo and N. Azevedo; Alternate Hosts of *B[acterium] vascularum*, by C. G. Hughes; Some Preliminary Trials on the Control of Sett-Rot in Natal, by A. McMartin; Sclerotic Disease of Sugarcane, by T. Kiryu and M. Okada; On the Nature of Resistance of Sugarcane to the Red Rot Disease, by R. E. Atkinson (La. State Univ.); A Study of the Common Mosaic of Sugarcane With Special Reference to Strains of the Virus, by E. M. Summers, *Cytospora* Rot of Sugarcane in Louisiana, by E. V. Abbott, Comparative Study of Sugarcane Mosaic in Different Countries, by J. Matz, and Sugarcane Diseases in the United States, by R. D. Rands and E. V. Abbott (all U. S. D. A.); Immunity Studies With Sugarcane Mosaic, by I. L. Forbes (La. State Univ.); Natural Hosts of *Bacterium vascularum* (Cobb) Gr. Smith in Mauritius, by G. Orian; Stubble Deterioration, by C. W. Edgerton, and The *Rhizoctonia* Disease of Bermuda Grass, Sugarcane, Rice and Other Grasses in Louisiana, by T. C. Ryker (both La. State Univ.); Stem Galls of Sugarcane Induced With an Insect Extract, by J. P. Martin; Dwarf or Multiple Bud Disease of Sugarcane in Louisiana, by E. C. Tims (La. State Univ.); and Effect on Factory Cane Juices and Sirups of *Leuconostoc mesenterioides* Isolated From Frost Damaged Louisiana Sugarcane of the 1937 Crop, by M. A. McCalip and H. H. Hall (U. S. D. A.).

Dry top rot disease, M. T. Cook. (P. R. Col. Expt. Sta.). (In *The Puerto Rico Sugar Manual. New Orleans, La.: A. B. Gilmore, 1938, pp. 12, 13*).—A note on this indigenous sugarcane disease, due to *Liguiera vascularum*, with bibliography.

Effect on factory cane juices and sirups of Leuconostoc mesenteroides isolated from frost damaged Louisiana sugarcane of the 1937 crop, M. A. McCalip and H. H. Hall. (U. S. D. A.). (*Jour. Bact., 37 (1939), No. 4, pp. 471, 472*).—An abstract.

Temperature relations of tobacco-mosaic virus and its host, J. Grainger (*Phytopathology, 29 (1939), No. 5, pp. 441–448, figs. 3*).—The temperature of optimum activity for this virus was found to differ from that of the host. Virus activity was measured by its rate of travel within the tobacco plant, and host activity by the rate of growth of the shoot. Both rates were measured at various temperatures, first in greenhouses and later in constant-temperature chambers with humidity and light standardized. Low-temperature masking of symptoms, previously reported by the author (E. S. R., 76, p. 207), was confirmed, growth of an infected tobacco plant at 48° F. resulting in the production of symptomless leaves. The results indicate that the virus has a certain independence of its host, insofar as reaction to temperature is concerned.

Disintegration of tobacco mosaic virus in urea solutions, W. M. Stanley and M. A. Lauffer (*Science, 89 (1939), No. 2311, pp. 345–347, fig. 1*).—From the experimental work reported it is concluded that this virus is rapidly disinte-

grated in 6 M urea and 0.1 M phosphate buffer at pH 7, with appearance of sulfhydryl groups, into low molecular weight protein components which contain no nucleic acid, exhibit no double refraction of flow, are insoluble in dilute buffers, and possess no virus activity. The rate of degradation varied widely with urea and electrolyte concentrations, type of electrolyte, pH, and temperature. It is believed that the results obtained may provide information on the nature of the forces which hold together the large virus molecule.

The disintegration of tobacco mosaic virus preparations with sodium dodecyl sulphate, M. SREENIVASAYA and N. W. PIRIE (*Biochem. Jour., 32 (1938), No. 10, pp. 1707–1710*).—"The kinetics of the disintegration of a tobacco mosaic virus preparation by sodium dodecyl sulfate are described and also the preparation and properties of the resulting unstable protein."

Vegetable seed treatment, J. G. HORSFALL (N. Y. State Expt. Sta.). (*U. S. Dept. Agr., Ext. Path. No. 37 (1939), pp. 26–32*).—A summary of recent progress, with 10 literature references.

Bean bacterial wilt, F. HEDGES (*U. S. Dept. Agr. Leaflet 174 (1939), pp. 6, figs. 6*).—This is an information leaflet (E. S. R., 58, p. 547).

Mild-mosaic virus of broad bean, T. F. YU (*Phytopathology, 29 (1939), No. 5, pp. 448–455, fig. 1*).—The author describes a new virus and the symptoms induced in several leguminous hosts. The virus was transmitted by *Aphis rumicis* and *Macrosiphum pisi*, and also by artificial juice inoculations with carborundum. It remained active for 3 hr. at 22°–24° C., but was inactivated at ±55°–60°. A dilution of 1:1,500 was tolerated. The bibliography contains 25 references.

Studies of the nature of root knot resistance, K. C. BARRONS. (Ala. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 4, pp. 263–271, pl. 1*).—Microscopical study of seedling rootlets of the resistant Alabama No. 1 and of the susceptible Kentucky Wonder beans indicated that about the same numbers of larvae of *Heterodera marioni* had entered the one as the other. Further study of the rootlets of a number of resistant and susceptible varieties and species of plants confirmed these initial results. More detailed observations and experiments on Hopi 155 lima bean in the field and in inoculated soil and on roots of different ages led to the hypothesis that resistance to root knot is due to substances synthesized by the plant that counteract the giant-cell-inducing effect of the salivary secretions of the larvae. Such an explanation is said to account for the known facts concerning hereditary resistance to this parasite. Two fundamentally important questions are postulated by the results, viz, whether host specialization may not be due to genetic differences in the chemical nature of salivary secretions and the resulting ability to induce giant-cell formation rather than to differences in ability to perceive and enter the host, and whether resistant plants may not be superior as trap crops, due to the fact that as many larvae appear to enter the roots of resistant as of susceptible plants, but with failure to reproduce in the former.

Tests demonstrate commercial value of resistant cabbage, O. A. REINKING and W. O. GLOYER (*Farm Res. [New York State Sta.], 5 (1939), No. 2, pp. 7, 8, 9, fig. 1*).—Extensive trials of both resistant and nonresistant domestic and Danish varieties on infected and healthy soils indicated that all the accepted commercial resistant varieties possess a high resistance, that in the yield tests on healthy soil in a dry year the resistant varieties yielded somewhat less than the nonresistant, and that when grown on sick soil the latter varieties produced no crop while the resistant ones gave normal yields. The investigation indicates "that there still is room for another midseason or domestic type of resistant cabbage better adapted to New York State cabbage centers. The

greatest need is for a good high-yielding, late, resistant variety. . . . In the meantime, growers will have to depend upon the resistant varieties reported upon here."

A new Fusarium-wilt-resistant tomato, M. C. STRONG (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 164–169, figs. 3*).—The development of a *Fusarium*-wilt-resistant strain of John Baer, otherwise similar to the commercial variety, is reported to have been produced by a process of selection (1934–38) in soil artificially infected with 50 isolates of *F. lycopersici* obtained from 15 States and from Australia and South Africa. It is said to require 63–73 days from transplanting of medium-sized seedlings not yet in bloom to the first commercial harvest, and it is believed to be adapted to all regions where the original variety is grown, particularly where this wilt is present, and to compare favorably in resistance to such well-known varieties as Marglobe and Pritchard. On a heavily infested soil this strain yielded 20 tons of fruit per acre, as against 8 tons by the commercial variety.

Nailhead spot of tomato, caused by Alternaria tomato (Cke.) n. comb., G. F. WEBER (*Florida Sta. Bul. 332 (1939), pp. 54, figs. 16*).—This bulletin details the results of experimental work and presents a compendium of information on tomato nailhead spot (83 literature references). This disease has been known in Florida for 25 yr., and is said to be responsible for millions of dollars worth of damage to the crop in Cuba, West Indies, Mexico, and the United States. Tomato, potato, eggplant, and horsenettle are all susceptible, and the different phases of the disease are described. The causal fungus has been transferred from *Macrosporium tomato* to *A. tomato* n. comb., and published errors concerning the disease it causes are pointed out. Certain physiological and morphological characteristics of the fungus are discussed, as well as the seasonal development of the spontaneous and experimental disease. The pathogenicity of the parasite was proved, and the morbid anatomy of the disease is demonstrated and explained.

Crystalline preparations of tomato bushy stunt virus, F. C. BAWDEN and N. W. PIRIE (*Brit. Jour. Expt. Path., 19 (1938), No. 4, pp. 251–263, pl. 1, fig. 1*).—The authors describe the isolation of a protein, probably identical with the virus, from infected tomato plants which not only differs from the normal plant proteins but also differs more from the other purified plant viruses than these differ among themselves. It is said to be fully crystalline, to have a higher nucleic acid content than tobacco mosaic or potato "X" viruses, and to be more stable towards pH changes but less so towards dehydrating agencies. Its particles are not elongated, and liquid and solid preparations are isotropic. When rubbed on *Nicotiana glutinosa*, 1 cc. of solution containing 10^{-7} gm. produced infections, and 1 cc. containing 10^{-6} gm. gave a specific precipitate with antiserum. Precipitates of the rod-shaped viruses with their antisera resemble those of the bacterial flagellar (H) antigens, while those of bushy stunt virus resemble those of the somatic (O) antigens. Irradiated with ultraviolet light or treated with HNO_2, the virus loses its infectivity, but it can still be crystallized and still retains its serological activity.

The preservative effect of some reducing systems on the virus of tomato spotted wilt, R. J. BEST (*Austral. Jour. Expt. Biol. and Med. Sci., 17 (1939), No. 1, pp. 1–17, fig. 1*).—Hydrogen in the presence of platinized platinum was found to arrest the normal aerobic inactivation of the virus, and thereafter to maintain the activity at a constant level for the duration of the test (8 hr.). Suspensions of the virus in the presence of cystein and absence of oxygen were kept in an active state for 35 days as compared to the normal in vitro "life" of a few hours. The sodium salts of glutathione, and thioglycolic and ascorbic

acids (all buffered at pH 7), preserved the virus against rapid aerobic inactivation. Adrenaline had no significant effect on the activity of suspensions exposed to air, but protected the virus against the slow inactivation occurring in the absence of oxygen. Redox potentials of the test systems are presented and discussed in relation to the relative efficiencies of the protective agents.

Several species of Pythium causing blossom-end rot of watermelons, C. DRECHSLER. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 5, pp. 391–422, figs. 14*).—Watermelon decay due to one or another of nine known species of *Pythium* has been found widely distributed in the United States. Where the crop grows and matures under moderately dry conditions the damage is usually insignificant, but rather substantial losses result in some parts of the Middle Atlantic States where during wet seasons a late crop is exposed to more abundant infection. For control under conditions favoring decay, an application of a suitable adhesive fungicidal paste to the flower scar is suggested. Normally the causal fungi enter uninjured fruit at the flower scar, their further advance being manifested externally either in a water-soaked appearance or a dark-brown discoloration, depending largely on the parasite concerned. Illustrated descriptive accounts of three species inducing dark-brown blossom-end rot (*P. acanthicum, P. periplocum,* and *P. helicoides*) are given to supplement the previously published diagnoses, discussion of the morphological features of *P. helicoides* entailing comparison especially with *P. proliferum* and the application accorded the latter species by various writers. Similar discussion is devoted also to *P. anandrum*, one of many species capable of causing experimental decay but thus far not known to occur spontaneously on watermelon fruits in the field. The morphological parallelism of *P. anandrum* and *P. megalacanthum* is noted. A bibliography of 32 references is given.

Fusarium wilt resistant watermelons, H. T. COOK and T. J. NUGENT. (Va. Truck Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 52 (1938), pp. 30–38, figs. 2*).—This note discusses several resistant varieties tested or developed by the station (E. S. R., 78, p. 650). The results of the 1938 tests showed particularly the extreme resistance of the Hawkesbury variety, none of this or the Kleckly Sweet hills being killed by wilt, while 5 percent of the Leesburg and 20 percent of the Klondike hills died. The data are summarized in a table.

Fruit diseases in 1938, W. D. MILLS. (Cornell Univ.). (*N. Y. State Hort. Soc. Proc., 84 (1939), pp. 7–13*).—A summary of the season's local disease situation for apple, stone fruits, strawberry, grape, and raspberry.

A note on the occurrence of Marasmius pyrinus, V. K. CHARLES. (U. S. D. A.). (*Mycologia, 31 (1939), No. 2, pp. 228–230, fig. 1*).—A note on a case of this rarely collected fungus occurring on apple fruit.

Will insoluble copper sprays control bitter rot under conditions favorable to the disease?—1938 results, K. J. KADOW, S. L. HOPPERSTEAD, and M. W. GOODWIN. (Univ. Del.). (*Peninsula Hort. Soc. [Del.] Trans., 52 (1938), pp. 99–102*).—The results reported confirm the belief that insoluble coppers are unreliable for apple bitter rot control, but they appear to be efficient for fruit spot, sooty blotch, and fly speck. However, before they are recommended generally their influence on lead arsenate-lime sprays for codling moth should be considered. The insoluble coppers caused much less fruit injury than bordeaux mixture, but were not as effective in preventing arsenical injury to the leaves, though some were commercially satisfactory. It is believed that the reduced russeting of the fruit by insoluble coppers may be a function of their inferior sticking powers.

The use of calcium cyanamid for the destruction of apothecia of Sclerotinia fructicola, G. A. HUBER and K. BAUR. (West. Wash. Expt. Sta.). (*Phytopathology, 29 (1939), No. 5, pp. 436–441, figs. 2*).—"Commercial pulverized

and oiled calcium cyanamide, applied with a knapsack duster to the surface of the soil and vegetative cover under prune trees at the rate of 220 lb. per acre at the beginning of apothecial production, destroyed apothecia of *S. fructicola* and prevented the development of others. Similar results were obtained when soil in wooden boxes, in which apothecia were developing, was treated with a surface application of calcium cyanamide at the rate of 324 lb. per acre."

Red stele—a new disease of the strawberry, J. H. Clark (*N. J. State Hort. Soc. News, 19 (1938), No. 6, p. 1050*).—This is a brief summary of data concerning a disease first reported in the United States in 1935, with special reference to New Jersey where it was found in 1938 on 4 of 40 farms inspected. The Pathfinder variety is said to be markedly resistant, and other varieties have shown some promise. The building up of a healthy stock of plants is strongly recommended.

A note on currant anthracnose, C. W. Robertson. (Mich. State Col.). (*Phytopathology, 29 (1939), No. 5, p. 459*).—In western Michigan, *Pseudopeziza ribis* was observed (1938) to have caused a severe yellowing and defoliation on Pres. Wilder currants, whereas no appreciable injury was seen on Prince Albert bushes in a nearby planting. *Mycosphaerella grossulariae* leaf spot was found on both varieties, but significant differences in resistance were not observable.

Disease attacks the persimmon, R. K. Beattie and B. S. Crandall (*Amer. Forests, 45 (1939), No. 3, pp. 120, 121, 124, figs. 5*).—This is a description and discussion of the hosts and distribution of the *Cephalosporium* disease previously noted as affecting *Diospyros virginiana* (E. S. R., 79, p. 645). Its spread over a large southern area is deemed particularly regrettable because of the value of this tree for soil conservation and erosion control.

Synergism in fruit-rotting fungi, A. R. Gemmell (*Chron. Bot., 5 (1939), No. 1, pp. 41, 42*).—The author presents an explanation based on his own experiments of the mutually advantageous relationship of *Penicillium digitatum* and *Oospora citriaurantii* causing a rot of citrus noted by Savastano and Fawcett (E. S. R., 61, p. 747).

Observations on so-called decline disease, R. H. Postlethwaite (*Date Growers' Inst. Rpt., 15 (1938), pp. 5–7*).—This is a brief review of published work by others and observations by the author on this disease of date palms, with discussion by K. Peck, [D. E.] Bliss, and [H. S.] Fawcett.

Disease-free parents for psorosis prevention, H. S. Fawcett. (Calif. Citrus Expt. Sta.). (*Pacific Rural Press, 137 (1939), No. 12, p. 280, figs. 2*).—See also a previous note (E. S. R., 80, p. 505).

Spoilage of dates as related to management of the fruit bunch, D. E. Bliss. (Calif. Citrus Expt. Sta.). (*Date Growers' Inst. Rpt., 15 (1938), pp. 7–12, fig. 1*).—The most important indication believed to have been obtained by these studies refers to the effects on fruit rot of aeration by fruit strand separation, by bags allowing increased ventilation of the fruit, and by removal of fruit strands from the center of the bunch. During two moderately wet years all three methods proved effective, but more so in combination than singly, while in the one dry year there was no decrease in rot with aeration. The principles involved in producing the best fruit are good nutrition and ripening in a relatively dry atmosphere. The types of bunch management satisfying these conditions must be varied to suit local seasonal and other conditions.

Flower-spot of azaleas: Directions given for identification and control, F. Weiss. (U. S. D. A.). (*South. Florist and Nurseryman, 46 (1939), No. 22, pp. 5, 12, 13, 16, 17*).—This is in the nature of a preliminary report on this recently recognized disease (*Ovulinia azaleae*) of cultivated azaleas, observed in all the Southeastern and Gulf Coast States from North Carolina to Louisiana.

The fungus is known also to infect flowers of rhododendron, mountain laurel, and some species of *Vaccinium*. The sclerotium is said to be the most vulnerable stage of the parasite, and sanitary control measures are directed there. Copper sprays or dusts may have some control value if applications are made prior to or coincident with the period of ascospore discharge, and acetic acid is said to have shown fungicidal possibilities with no apparent toxic effect on azaleas when properly diluted. In any trials these materials should be applied to the ground surface beneath the bushes, as well as lightly but thoroughly over the foliage, starting as soon as any buds show color and repeating at 3-day intervals until the blooms are fully open.

The Verticillium disease of chrysanthemums and its control, P. E. TILFORD, H. A. RUNNELS, and C. MILLER. (Ohio Expt. Sta. et al.). (*Chrysanthemum Soc. Amer. Bul., 7 (1939), No. 1, pp. 9–16*).—The symptoms of the *V. dahliae* disease are described, and tests are reported as showing that roguing the diseased plants from the stock and selecting the more vigorous individuals for propagation greatly reduces the incidence. According to the results of variety tests the large flowering, exhibition, pompon, anemone-flowered, daisy-type, pot-plant, hardy, and Korean varieties included are each grouped according to susceptibility and resistance.

Two new diseases of gladioli, R. NELSON. (Mich. State Col.). (*Gladiolus Ann., 1939, pp. 32–37*).—A summary is given of present information on *Fusarium* yellows (E. S. R., 79, p. 499), the history of which appears to be comparatively recent, and of progress in tests to segregate the resistant and susceptible varieties (with lists). Another disease said to be increasing in commercial stocks but to be much less serious is the basal dry rot (*Fusarium* sp.), which is described with suggested control measures.

Fungicides for roses, L. M. MASSEY. (Cornell Univ.). (*Amer. Rose Ann., 1939, pp. 103–111*).—The author summarizes present recommendations for rose disease control by the various sulfur and copper fungicides, with special reference to the experimental results at Ithaca.

Roguing of dark red tulips for mosaic disease, F. P. MCWHORTER. (Oreg. Expt. Sta.). (*Florists Exch. and Hort. Trade World, 92 (1939), No. 3, p. 17*).—By means of inoculation studies the type of "break" which may be expected in 49 varieties of red Mendel tulips was determined. The results are tabulated and discussed, with the base color of the plant indicated in each case. The generalization that all blue-base pigments accompany self-break is not applicable to all other kinds of red tulips, but the probability that all blue-based varieties will "self" should, it is believed, be of real value in roguing tulips when complete elimination of virus-infected bulbs is desired.

Some important shade tree diseases of the Mid-West, F. C. STRONG. (Mich. State Col.). (*Natl. Shade Tree Conf. Proc., 14 (1938), pp. 106–118, figs. 7*).—This is a general discussion of the more important parasitic and nonparasitic diseases, including drought and winter injuries, chlorosis (parasitic and nutritional forms), cedar rust, leaf diseases, wilts (particularly of elm and maple), cankers, and chestnut blight.

Eradication of the cultivated black currant in white pine regions, J. F. MARTIN (*U. S. Dept. Agr. Leaflet 175 (1939), pp. 8, figs. 5*).—This is an information leaflet relating to white pine blister rust control by black currant eradication.

A study of Botryosphaeria ribis on willow, F. T. and F. A. WOLF (*Mycologia, 31 (1939), No. 2, pp. 217–227, figs. 4*).—A disease of willows due to *B. ribis* is characterized by cankers on the twigs, larger branches, and trunk, successive blighting of the branches finally resulting in the death of the tree.

A single stroma on willow may at one time bear conidia, microconidia, and ascospores. Cultures from conidia or from ascospores were similar, and the *Dothiorella* stage was produced from both. The conidia were found to be multinucleate but borne on uninucleate conidiophoral cells. The development of nuclei in the ascus is like that of other Ascomycetes. The ascospores are uninucleate when delimited but become multinucleate as they mature. For a time after germination the hyphal cells are also multinucleate. There are 11 literature references.

Poria andersonii and Polyporus glomeratus, two distinct heart-rotting fungi, W. A. CAMPBELL and R. W. DAVIDSON. (U. S. D. A.). (*Mycologia, 31 (1939), No. 2, pp. 161–168, figs. 2*).—Characters in nature and in culture and the distribution were studied for these two species. *Poria andersonii* is one of the fungi commonly isolated from trunk decay in living oaks throughout the Middle West, causing a white decay resembling that due to *Fomes everhartii* and entering usually through branch stubs but also through fire scars or other injuries. *Polyporus glomeratus* induces a white to light brown spongy heart rot of maples and is common (especially on sugar maples) in some parts of the Lake States. There are 11 literature references.

The biology of the meadow nematode Pratylenchus pratensis (De Man) Filipjev 1936, R. J. HASTINGS (*Canad. Jour. Res., 17 (1939), No. 2, Sect. D, pp. 39–44*).—"The meadow nematode completes its life cycle in 54 to 65 days—25 to 31 days from the larval stage to the adult, and 29 to 34 days from maturation to the second generation. Eggs are deposited by a single female at the rate of not more than one a day. The largest number of eggs laid by a single female in one place was 16, owing apparently to migratory habits. The total number of eggs from a single female could not be determined. The adult male and female and all larval stages of this species are capable of entering the roots of oats. They are very susceptible to desiccation. No living nematodes were recovered from invaded root tissue that was allowed to dry. In moist excised oat roots the nematodes remained viable for more than 30 days, but in water the majority died within the same period. A 10-min. immersion of infested oat roots in hot water will destroy the meadow nematode only when the temperature is 120° F., or higher."

Predaceous nematodes of the genus Aphelenchoides from Hawaii, J. R. CHRISTIE. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 4, pp. 161–170, figs. 3*).—The author refers to the work of Linford and Oliveira (E. S. R., 77, p. 65) on nemas preying on other nemas, including *Heterodera marioni*, and presents drawings and descriptions of five cultures of the "long tailed" group of *Aphelenchoides* received from these authors—one a new variety and three of them new species. A key to the five species studied is provided.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Animal ecology, A. S. PEARSE (*New York and London: McGraw-Hill Book Co., 1939, 2. ed., pp. XII+642, figs. 133*).—A complete revision of the work noted (E. S. R., 55, p. 657), to which seven chapters have been added.

Animal communities in temperate America, as illustrated in the Chicago region: A study in animal ecology, V. E. SHELFORD (*Geog. Soc. Chicago Bul. 5, 2. ed., [1937], pp. XIII+368, [pls. 2], figs. [315]*).—In this second edition (E. S. R., 32, p. 549) the subject is dealt with in 15 chapters, followed by an appendix on methods of study and a bibliography of 214 titles.

Simple methods by which farmers and sportsmen can improve wildlife habitats on agricultural lands, J. N. MORTON (*Pa. Game Comn. Bul. 16 (1938), pp. 40, figs. 46*).

[Contributions in economic zoology] (*Kans. Acad. Sci. Trans., 41 (1938), pp. 299–302, 317–329, 331–367, 379–384, 387–394, figs. 16*).—Contributions presented in March and April 1938 are: Susceptibility of Mature Chickens to Tapeworm Infections, by J. E. Ackert and A. A. Case (pp. 299–302) (Kans. Expt. Sta.); Effects of Nicotine on Rats (Albino), by H. E. Branch and W. G. Moss (pp. 317–329); The Frogs and Toads of the Southeastern United States, by C. E. Burt (pp. 331–367); Transmission of Poultry Parasites by Birds With Special Reference to the "English" or House Sparrow and Chickens, by W. L. Hoyle (pp. 379–384); and An Attempt at an Ecological Evaluation of Predators on a Mixed Prairie Area in Western Kansas, by L. D. Wooster (pp. 387–394).

[Contributions on entomology and ornithology] (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 22 (1939), No. 4, pp. 483–512, fig. 1*).—Contributions presented are: Alternate Host Plants of the Pink Bollworm (*Pectinophora gossypiella* (Saund.)) in Puerto Rico, by L. C. Fife (pp. 483–492), A Search in the Guianas and Trinidad for Predatory Beetles of the Bamboo Scales (pp. 493–495) and A Dryinid Parasite [*Gonatopus* n. sp.] Attacking *Baldulus maidis* in Puerto Rico (pp. 497, 498), both by K. A. Bartlett, and Ecological Notes on Mosquitoes Associated With Bromeliads, by G. S. Tulloch (pp. 499–501) (all U. S. D. A.); and The Birds of Saba, by S. T. Danforth (pp. 503–512) (Univ. P. R.).

Standardization of the precipitin technique and its application to studies of relationships in mammals, birds, and reptiles, H. R. Wolfe. (Univ. Wis.). (*Biol. Bul., 76 (1939), No. 1, pp. 108–120*).—In the work reported antibodies were produced in rabbits by injecting very small quantities of serum proteins of mammals, birds, and reptiles. Antiserums produced by injection of a minimum quantity of antigen were the most specific as determined by the "ring" method. Occasionally the serum proteins of such closely related animals as ox and sheep or gray squirrel and red squirrel could be distinguished. Antiserum dilutions as low as 1:3 at times eliminated the heterologous reaction. The ring appeared in the homologous and very closely related protein solutions earlier than in the more distantly related ones when incubated at temperatures of $37° \pm 1°$ C. It was not possible to distinguish between the buffalo and ox serum proteins or between the goat and sheep serum proteins. Serological relationship studies of birds and reptiles seem feasible. The procedures have not been entirely new, but the necessity for uniformity and standardization of methods has been emphasized.

A list of 17 references to the literature cited is included.

Protection of mountain apiaries from bears by use of electric fence, T. I. Storer, G. H. Vansell, and B. D. Moses. (Univ. Calif. and U. S. D. A.). (*Jour. Wildlife Mangt., 2 (1938), No. 4, pp. 172–178, fig. 1*).

Beaver food utilization studies, S. E. Aldous (*Jour. Wildlife Mangt., 2 (1938), No. 4, pp. 215–222, pl. 1, figs. 4*).—Aspen is shown to be the most important food species of beavers in the Superior National Forest, Minn., with birch, alder, and willow next in rank. "The degree of utilization of aspen based on measurements of 456 trees was 36 percent and of waste 64 percent. The greatest complete wastage occurs in trees between 4 and 6 in. in diameter because there is usually a heavier stand of these sizes and more of the cut trees lodge, thus preventing utilization. Feeding experiences show that beavers consume between 22 and 33 oz. of aspen bark and twigs daily."

The jack rabbit brings money to North Dakota, S. Saugstad (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 4, pp. 8–10*).—Attention is called to the economic value of jack rabbit skins and carcasses, the sales of which in the State have reached as high as $100,000 annually. It is pointed out that the

potential income from this source in the State should not be overlooked whenever a proposed program of extermination is considered.

A water rat (Hoplochilus sciureus berbicensis Morrison-Scott) damaging sugar-cane in British Guiana, L. D. Cleare (*Agr. Jour. Brit. Guiana, 9 (1938), No. 4, pp. 217–229, pls. 3*).—An account is given of an outbreak of rats which occurred at Blairmont Estate, Berbice, British Guiana. The rat concerned represents a new subspecies known as *H. sciureus berbicensis*.

Notes on the den ecology of the striped skunk in Iowa, L. F. Selko. (Iowa Expt. Sta., U. S. D. A., et al.). (*Amer. Midland Nat., 20 (1938), No. 2, pp. 455–463, figs. 5*).—The results of observations of the prehibernation den environment of striped skunks in the autumn, the den environment of individual skunks in the spring and summer, and the den environment of skunk families in the spring and summer are reported, the details being given in tables.

Notes on the southern woodchuck in Missouri, A. R. Twichell. (Univ. Mo.). (*Jour. Mammal., 20 (1939), No. 1, pp. 71–74*).—In reporting on the biology of the southern woodchuck (*Marmota monax monax*), observed in central Missouri, the author records *Ixodes texanus* as the only external parasite detected. The largest number found on a single animal has been 6. *Obeliscoides cuniculi* was the only endoparasite found in 19 animals examined, 6 having been attached to the mucosa of one stomach and 2 to another.

Catalogue of birds of the Americas, XI, C. E. Hellmayr (*Field Mus. Nat. Hist. [Chicago] Pub., Zool. Ser., 13 (1938), pt. 11, pp. VI+662*).—A continuation of this work (E. S. R., 79, p. 215) in which the families Ploceidae, Catamblyrhynchidae ,and Fringillidae are cataloged.

A synopsis of North American birds of prey and their related forms in other countries, L. R. Wolfe (*Bul. Chicago Acad. Sci., 5 (1938), No. 8, pp. 167–208, figs. 10*).—The distribution of the species and subspecies of birds of prey which occur in North America and their geographical races in other parts of the world are briefly outlined. Major characters which separate the forms are indicated, but no attempt is made at complete descriptions.

The birds of tropical west Africa, with special reference to those of the Gambia, Sierra Leone, the Gold Coast, and Nigeria, V, D. A. Bannerman (*London: Crown Agents for Colonies, 1939, vol. 5, pp. XLIII+485, pls. [11], figs. [138]*).—This further volume (E. S. R., 79, p. 71) is devoted to seven families of the large order of Passeriformes, or perching birds, in addition to the eight dealt with in volume 4.

Sparrows, towhees, and longspurs, T. G. Pearson (*Natl. Geog. Mag., 75 (1939), No. 3, pp. 353–376, pls. 8, figs. 5*).—This descriptive account includes eight colored plates which illustrate the forms considered.

Recent disastrous effects of oil pollution on birds in the San Francisco Bay region, J. Moffitt and R. T. Orr (*Calif. Fish and Game, 24 (1938), No. 3, pp. 239–244, figs. 2*).—A report of observations of water fowl following oil pollution of coastal waters contiguous to San Francisco Bay as the result of an oil tanker shipwreck. Of the offshore species of birds, California murres suffered most, followed by scoters and western grebes. "Offshore ranging forms such as murrelets, auklets, shearwaters, and petrels were apparently spared because the oil did not extend sufficiently far from shore to embrace their habitats. In the quiet bays, western grebes, white-winged scoters, ruddy ducks, eared grebes, and red-throated loons suffered most in the order named."

Seasonal abundance of some parasites of wild ducks, W. C. Gower (*Jour. Wildlife Mangt., 2 (1938), No. 4, pp. 223–232, figs. 5*).—In this report the prevalance, both total and seasonal, and something of the host-parasite relation-

ships are discussed for 11 genera of wild duck parasites. A list of 15 references to the literature cited is included.

The great horned owl as an indicator of vulnerability in prey populations, P. L. ERRINGTON. (Iowa Expt. Sta.) (*Jour. Wildlife Mangt., 2 (1938), No. 4, pp. 190–205, pls. 4*).—This contribution is presented with a list of 23 references to the literature cited.

Some saw-whet owls in central Iowa, T. G. SCOTT. (Iowa Expt. Sta.). (*Wilson Bul., 50 (1938), No. 4, pp. 239–242, fig. 1*).—Data on the habits of a saw-whet owl *Cryptoglaux acadica acadica* in central Iowa, where it is an uncommon and irregular visitor, obtained during the winter of 1936–37, have shown about 97 percent of the food to have consisted of mice and shrews. White-footed and meadow mice formed the greater part of the food, 60 percent of the total prey having been white-footed mice. The remaining 3 percent of the food was birds, thought to be slate-colored juncos.

The food and cover relationship in the winter survival of the ring-necked pheasant (Phasianus colchicus torquatus Gmelin) in northern Iowa, W. E. GREEN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 12 (1938), No. 3, pp. 285–314, figs. 30*).—Studies conducted on a tract of 4,900 acres in Winnebago County, Iowa, from November 11, 1935, to March 5, 1936, are reported.

Greater prairie chicken breeding in Davis County, Iowa, 1938, M. F. BAKER and G. O. HENDRICKSON. (Iowa Expt. Sta., U. S. D. A., et al.). (*Iowa Bird Life, 8 (1938), No. 4, pp. 46–49, fig. 1*).—A report based upon observations of *Tympanuchus cupido americanus* Reich. through five summers.

Studies of the nesting cycle of the California valley quail in 1937, B. GLADING. (U. S. D. A.) (*Calif. Fish and Game, 24 (1938), No. 4, pp. 318–340, figs. 11; also in Calif. Conserv., 4 (1939), No. 1, pp. 3–6, figs. 3*).—In the studies reported, based upon observations of the California valley quail (*Lophortyx californica vallicola*) found on the San Joaquin Experimental Range in Madera County, Calif., the average clutch size in 40 incubated nests was found to be 10.97 eggs. The average brood size in 16 hatched nests was 10.18 young.

Censusing quail in early fall, L. J. BENNETT and G. O. HENDRICKSON. (Iowa Expt. Sta., U. S. D. A., et al.). (*Jour. Wildlife Mangt., 2 (1938), No. 4, pp. 169–171*).

The crawfishes of Mississippi, with special reference to the biology and control of destructive species, C. LYLE (*Iowa State Col. Jour. Sci., 13 (1938), No. 1, pp. 75–77*).—Notes on the biology and control of the crawfish (*Cambarus hagenianus*), which inhabits the lime soils of Mississippi and Alabama and on rainy spring nights often destroys entire fields of young corn and cotton, are presented.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 150–156*).—The contributions presented (E. S. R., 80, p. 651) are: The Dung Rolling Beetle [*Canthon pilularius* (L.)] as a Host of a Sarcophagid Parasite [*Sarcophaga alcedo* Ald.], by K. A. Bartlett (p. 150), Breeding Areas of the Tomato Psyllid *Paratrioza cockerelli* (Sulc), by V. E. Romney (p. 150), and *Peregrinator biannulipes* Montr., a Predator of the Bamboo Powder-Post Beetle in Porto Rico, by H. K. Plank (p. 151) (all U. S. D. A.); A Disease of the Corn Ear Worm (*Heliothis obsoleta* (F.)), by N. Stahler (Univ. Calif.); A Feed Record of *Pterostichus* (*Poecilus*) *chalcites* (Say) Upon June Beetle Eggs and Grubs, by L. Seaton (pp. 151, 152) (U. S. D. A.); A Black Scale Parasite [*Diversinervus* sp.] With Promising Qualities, by S. E. Flanders (p. 152) (Calif.

Citrus Expt. Sta.); *Prophanurus alecto* Crawford in Porto Rico, by G. N. Wolcott (pp. 152, 153) (P. R.); Tartar Emetic in the Control of Citrus Thrips on Lemons, by A. M. Boyce and C. O. Persing (p. 153) (Calif. Citrus); Lead Arsenate as a Possible Control for the White Grub [*Phyllophaga* sp.] in Strawberries, by T. W. Kerr, Jr., (p. 153) (Cornell Univ.); Magnesium Oxide as a "Corrective" for Cryolite Sprays, by S. Marcovitch (pp. 153, 154), and Wool Grease or Degras as a Substitute for Mineral Oil in Sprays, by S. Marcovitch and W. W. Stanley (p. 154) (both Tenn.); An Agar Preparation for Feeding Adult Parasite Insects, by J. K. Holloway (p. 154) (U. S. D. A.); The Asparagus Beetle in Utah, by G. F. Knowlton (pp. 154, 155) (Utah); Notes on *Empusa grylli* in Oklahoma, by R. R. Walton and F. A. Fenton (pp. 155, 156) (Okla.); Notes on Food for Corn Ear Worm Adults, by E. V. Walter and D. W. LaHue (p. 156) (U. S. D. A.); and Elm Leaf Beetle in Utah, by G. F. Knowlton and F. C. Harmston (p. 156) (Utah).

[Report of work in entomology] (*California Sta. [Bien.] Rpt. 1937–38, pp. 47–54, 95*).—The work of the biennium 1937–38 referred to (E. S. R., 76, p. 824) includes new parasites for red and black scale, control of scales on citrus by chemicals, dusts for the orange tortrix, second-brood codling moth on walnuts, walnut husk fly, sprays for red spiders and for the mealy plum aphid, control of thrips on various crops, pear leaf blister mite, cyclamen mite, control of globe-artichoke insects, cotton pests in the San Joaquin Valley, importance of bee culture in California, bee losses from poisonous dusts, improved methods of bee shipping, and electric protection for mountain apiaries from bears.

[Work in entomology by the Delaware Station] (*Delaware Sta. Bul. 214 (1938), pp. 22–26*).—The work of the year (E. S. R., 78, p. 510) briefly reported relates to the occurrence of several important insects and factors responsible for the development of one and two annual broods of the plum curculio, both by L. A. Stearns; bionomics and control of the codling moth, by Stearns, R. L. Pierpont, W. W. Fassig, and P. L. Rice, of the oriental fruit moth, by Stearns and Rice, and of the Tabanidae of Delaware, by D. McCreary; and mosquito investigations, including the effect of ditching on muskrat production, by Stearns, MacCreary, and F. C. Daigh.

[Work with economic insects by the Florida Station]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1938, pp. 82, 83, 84–86, 106, 107, 146, 147, 153, fig. 1*).—The work of the year referred to (E. S. R., 79, p. 502) includes miscellaneous observations; the Florida flower thrips *Frankliniella cephalica bispinosa* Morg. and the onion thrips, both by J. R. Watson; the introduction and propagation of beneficial insects, particularly the Chinese ladybeetle *Leis dimidiata 15-spilota* Hope, by Watson and W. L. Thompson; control of the leaf-footed bug on Satsuma oranges, by H. E. Bratley; control of fruit and nut crop insects, particularly the nut case-bearer, by S. O. Hill, Watson, and Bratley; the gladiolus thrips and the pepper weevil, both by Watson and J. W. Wilson; the biology and control of Florida aphids, including the corn leaf aphid and the grapevine aphid, and the discovery of three species of gall-forming aphids (the woolly elm aphid, *Georgiaphis ulmi* (Wilson), and *Colopha graminis* (Monell)) on elms at Gainesville, by A. N. Tissot; fumigation of green cowpea pods, tomato plants, and seeds, by R. J. Wilmot; the orange tortrix and the coccid moth *Laitilia coccidivora* Comst. and control of purple scale and white flies with lime-sulfur, both by Thompson at the Citrus Substation; and control of the bean jassid and the pea aphid by R. N. Lobdell at the Everglades Substation.

Pest eradication work in Florida, J. F. Cooper. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 9, pp. 5, 9, 16, 17, 20, figs. 2*).—A summary is given of

work directed by the State Plant Board in eradicating many of the insect pests and other serious enemies of agriculture in Florida.

[**Contributions on economic insects**] (*Kans. Acad. Sci. Trans., 41 (1938), pp. 181–191, figs. 11*).—Contributions presented in March and April 1938 are: Parasite Emergence Holes as an Aid in Determining Hessian Fly Infestation in Mature Wheat Plants, by E. T. Jones (pp. 181, 182) (U. S. D. A.); and A Preliminary Report on the Insects Attacking Bindweed, With Special Reference to Kansas, by R. C. Smith (pp. 183–191) (Kans. Expt. Sta.).

[**Work in entomology by the New York State Station**] (*New York State Sta. Rpt. 1938, pp. 19–21*).—Brief report is made of work with economic insects and their control, including especially forms attacking the apple, peach, and cherry, vegetables (the European corn borer, corn earworm, pea aphid, pea weevil, Mexican bean beetle, cabbage aphid, cabbageworms, etc.), and several injuring ornamental and nursery plants.

[**Contributions on fruit and nut insects and their control**] (*Oreg. State Hort. Soc. Ann. Rpt., 30 (1938), pp. 65–68, 72–84, 141–147*).—Among the contributions presented at the annual meeting in December 1938 are the following: Insect Pests of Small Fruits, by W. D. Edwards (pp. 65–68) (Oreg. State Col.); Report of the Cherry-Fruit Fly Committee, by A. C. Berntzen (pp. 72–74); Biology and Control of the Cherry Fruit-Fly in the Willamette Valley, 1938, by S. C. Jones (pp. 75–78) (Oreg. State Col.); Cherry Fruit-Fly, by A. L. Marble (pp. 79, 80); Discussion on Pear Thrips on Prunes, by R. E. Rieder (pp. 81–84); Progress Report on the Control of Filbert Insects, by B. G. Thompson (pp. 141–144) (Oreg. Expt. Sta.); and Studies of Filbert Insects, by S. M. Dohanian (pp. 145–147) (U. S. D. A.).

[**Work in entomology by the South Dakota Station**], H. C. SEVERIN (*South Dakota Sta. Rpt. 1938, pp. 30–32*).—The work of the year (E. S. R., 79, p. 504) reported upon relates to the grasshoppers (Acrididae) of South Dakota—their economic importance, distribution, life histories, and control, and a study of the blister beetles (Meloidae) of economic importance in the State.

[**Contributions on economic insects**] (*Va. State Hort. Soc. Rpt., 43 (1938), pp. 38–46, 131–136, 162–165*).—Among the contributions presented are: The Japanese Beetle Situation, by G. T. French (pp. 38–46); and A Progress Report on Ethylene Dichloride for Peach Tree Borer Control, by M. L. Bobb (pp. 131–136), and The Present Status of Scale and Aphids and Their Control, by W. S. Hough (pp. 162–165) (both Va. Expt. Sta.).

[**Work in economic entomology by the Washington Station**] (*Washington Sta. Bul. 368 (1938), pp. 25, 26, 27, 36–40, 84, 85, 87, 88*).—The work of the year briefly reported (E. S. R., 79, p. 360) includes the chemistry of insecticides, by K. Groves and J. L. St. John; sprays for codling moth control, by Groves and H. Fallscheer; spray residue removal, by Groves, St. John, and Fallscheer; mineral oil sprays for insecticides and the possibilities of replacing lead arsenate in the control of codling moth and other injurious apple pests by insecticides nonpoisonous to man, both by R. L. Webster and J. Marshall; the control of five species of orchard spider mites, by Marshall; the influence of alfalfa on pea aphids in eastern Washington, the tomato fruitworm, and insecticidal values of dry and liquid lime-surfur, all by Webster and R. D. Eichmann; reducing onion thrips damage to greenhouse carnation blossoms, by Eichmann; and the cherry fruitworm in western Washington, by E. P. Breakey and Webster. Work at the Irrigation Substation consisted of wireworm investigations, by K. E. Gibson (coop. U. S. D. A.). Work at the Cranberry-Blueberry Substation, by D. J. Crowley, included scale control with dormant sprays, sprays for fireworm control, and fruitworm observations.

[Reports of the entomologist for the years 1936 and 1937], A. PICKLES (*Trinidad and Tobago Dept. Agr. Rpts., 1936, pp. 57, 58; 1937, pp. 71, 72*).—A brief report is given of the work for 1936 (E. S. R., 76, p. 502) with insects affecting sugarcane, cacao, bananas and plantains, citrus, and stored products, and for 1937, particularly on the occurrence of and control work with insects attacking sugarcane and cocoa and citrus investigations in Grenada and Carriacou.

The problems of applied entomology in Pernambuco, Brazil, [I], II, L. PYENSON (*Rev. Ent., 8 (1938), No. 3–4, pp. 237–254, figs. 3; 9 (1938), No. 1–2, pp. 16–31*).—Part 1 of this contribution considers the conditions in Pernambuco influencing insect activities and abundance, and part 2 is a preliminary account of some of the pests of the various crops of the state that have been observed and identified.

Insects and other pests injurious to the production of seed in herbage and forage crops, H. F. BARNES (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Herb. Pub. Ser. Bul. 20 (1937), pp. 31+III*).—A practical summary of information contributed from the Rothamsted Experimental Station.

Insects and a mite found on cotton in Puerto Rico, with notes on their economic importance and natural enemies, L. C. FIFE (*Puerto Rico Sta. Bul. 39 (1939), pp. 14*).—A systematically arranged list of the insects and acarids found on cotton in Puerto Rico, with the natural enemies of some, is followed by brief discussions of their importance and a list of 45 references to the literature cited.

Controlling insects on raspberries, R. HUTSON (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 230–235, figs. 4*).—A brief practical account of control measures for insects attacking the canes and foliage of the raspberry.

Citrus-cultivation and citrus-entomology in Malta, F. S. BODENHEIMER (*Hadar, 11 (1938), No. 10, pp. 290–294*).—Observations made of citrus insects of economic importance in Malta in January 1938 are reported (pp. 292–294).

Fall clean-up measures against [cloudy-winged] whitefly and scale in citrus groves, J. R. WATSON. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 10, p. 14*).

Pests of the mango tree in the Dutch East Indies [trans. title], C. J. H. FRANSSEN (*Landbouw [Buitenzorg], 14 (1938), No. 10, pp. 620–637; Eng. abs., pp. 636, 637*).—A concise account of the more important insect enemies of mango in the Dutch East Indies, presented with a list of 16 references.

[Contributions on entomological technic] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1938, ET–121, pp. 2, pl. 1; ET–122, pp. 2, pl. 1; ET–123, pp. 2, pls. 3; ET–124, pp. 2, pls. 2; ET–125, pp. 3, pls. 2; ET–126, pp. 2, pl. 1; ET–127, pp. 2, pls. 2; ET–128, pp. 2, pl. 1; ET–129, pp. 2, pls. 3; ET–130, pp. 2, pl. 1; ET–131, pp. 2, pl. 1; ET–132, pp. 2, pls. 3; ET–133, p. 1, pls. 2; ET–134, pp. 2, pl. 1; ET–135, pp. 4, pls. 2; ET–136, pp. 3, pl. 1; 1939, ET–137, pp. 2, pls. 2; ET–138, pp. 2, pls. 2; ET–139, pp. 3, pls. 4; ET–140, p. 1, pl. 1; ET–141, p. 1, pls. 2; ET–142, pp. 3, pls. 2*).—Further contributions (E. S. R., 79, p. 504) are A Convenient Cage for Determining Field Populations of the Potato Leafhopper, by F. W. Poos and J. W. Scrivener (ET–121); Apparatus and Method for Filling Lepidopterous Larvae With Wax, by J. C. Silver (ET–122); A Method of Keeping Records on Replicated Plots, by J. Wilcox (ET–123); A Simple and Effective Larval Trap for Hornworms, by A. H. Madden and F. S. Chamberlin (ET–124); A Counting-Cage Heater for Winter Studies of Insect Populations in the Field, by O. A. Hills (ET–125); Modifications of Square-Foot Sampler, by H. E. Dorst (ET–126) (E. S. R., 69, p. 825); An Injector for Forcing Liquids Into the Soil, by C. B. Eaton (ET–127); Specimen Supports for Objects Photographed

From Above, by C. B. Nickels (ET-128); A Simple Method of Testing Camera Shutter Speeds for Between-the-Lens Shutters, by G. W. Still (ET-129); Emergence Cages for Light-Attracted Insects, by H. C. Donohoe (ET-130); An Improved and Inexpensive Oviposition Cage for Insectary Use, by O. I. Snapp and J. R. Thomson, Jr. (ET-131); Equipment and Methods for Estimating Dried Fruit Beetle Populations in Soil, by C. K. Fisher, and D. F. Barnes (ET-132); A Reel for Carrying Rolls of Tree-Banding Material, by M. A. Yothers and F. W. Carlson (ET-133); A Simple Hand-Operated Soil-Sifting Device, by M. A. Yothers (ET-134); A Machine for Separating Mosquito Eggs From Soil, by C. M. Gjullin (ET-135); A Suggested Method for the Determination of the Ether-Extractives Content of Small Insects, by W. C. Cook (ET-136); An Automatic Wind-Direction Recorder Adapted to an Electrical Recording Thermometer, by R. A. Fulton (ET-137); A Special Cage for Confining Insects on Tall Plants or Portions of a Plant, by O. A. Hills (ET-138); A Revolving Plant Cage for Use in Insect Selectivity Studies, by J. A. Gillett and J. R. Douglass (ET-139) (Idaho Expt. Sta.); An Improved Method of Labeling Jelly-Glass Rearing Containers (ET-140) and A Portable Stand for Outdoor Photography (ET-141), both by A. H. Madden; and A Telescopic Spray Extension Rod for Use in Bark Beetle Control Work, by J. C. Evenden (ET-142).

Plant breeding and selecting for insect resistance, R. G. Dahms and F. A. Fenton. (U. S. D. A. and Okla. A. and M. Col.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 131–134*).—A discussion of this subject in which the discovery of resistant varieties, the breeding program, and the cause of insect resistance are considered.

Host-finding by insect parasites.—I, Observations on the finding of hosts by Alysia manducator, Mormoniella vitripennis, and Trichogramma evanescens, J. Laing (*Jour. Anim. Ecol., 6 (1937), No. 2, pp. 298–317, figs. 5*).—With a view to determining the manner in which certain insect parasites find their hosts, *T. evanescens* Westw. was investigated and a brief study made of certain aspects of the behavior of the braconid *A. manducator* Panz. and the chalcid *M. vitripennis* Walk.

It was found that within a host-containing area *T. evanescens* is able to perceive its hosts (eggs of the Angoumois grain moth) by the sense of sight, but that it does not appear to perceive them at a distance by the sense of smell, although it is attracted to traces left by females of the Angoumois grain moth. "*Trichogramma* normally moves about in straight or widely curving lines with only occasional abrupt turns. On such a path, it finds its first host. When it leaves that host, however, or any host which it has parasitized or examined, it moves quite differently, taking a spiral, twisted path. This change of behavior greatly increases the frequency of contact between the parasite and its hosts."

It was shown by experiments that *A. manducator* and *M. vitripennis* are attracted to an environment likely to contain their hosts by qualities of the environment itself, independent of the presence of hosts. Evidence is adduced that several other parasites are likewise first attracted to a special type of situation, in which they then seek their hosts.

A list is given of 18 references to the literature.

The food of adult partridges (Perdix perdix and Alectoris rufa) in Great Britain, A. D. Middleton and H. Chitty (*Jour. Anim. Ecol., 6 (1937), No. 2, pp. 322–336, pls. 2, fig. 1*).—An analysis made of the contents of the crops taken from 429 adult gray partridges (*P. perdix*) and 29 red-legged partridges (*A. rufa*), collected in all parts of Great Britain, is reported upon

in this contribution. It was found that the food eaten by the common gray partridge changes seasonally, being composed largely of seeds and grain in autumn and nearly all grass and green leaves in late winter and spring. Sugar beet pulp is eaten during winter. Flowers and buds form an important part of the food during summer. Animal food (mostly ants and their pupae) occurs in significant quantities only during the summer months. The food of the red-legged partridge is similar.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1938, E-451, pp. 42; E-452, pp. 7, pls. 3; E-453, pp. 174; E-454, pp. 5, pl. 1; E-455, pp. 16; E-456, pp. 3; E-457, pp. 28; E-458, pp. 3; E-459, pp. 3; E-460, pp. 12, pls. 2; E-461, pp. 6; 1939, E-462, pp. 5; E-463, pp. 221; E-464, pp. 22, pls. 2; E-465, pp. 3; E-466, pp. IX+145; E-467, pp. 25; E-468, pp. [1]+79*).—The following contributions are in continuation of this series (E. S. R., 80, p. 365); The Arsenates of Magnesium as Insecticides—A Review of the Literature, by F. E. Dearborn (E-451); Grasshopper Control by Tillage and Seeding Methods, by J. R. Parker (E-452); *Lonchocarpus* (Barbasco, Cube, and Timbo)—A Review of Recent Literature, by R. C. Roark (E-453); Combating the American Dog Tick, Carrier of Rocky Mountain Spotted Fever in the Central and Eastern States, by F. C. Bishopp and C. N. Smith (E-454); Legislation in the United States for the Control of Insects and Other Plant Pests, by L. A. Strong (E-455); Pyrethrum Larvicides for Mosquito Control (E-456); References to Reviews and Popular Articles on Derris, by R. C. Roark (E-457); Fumigation of Dormant Deciduous Nursery Stock for the Oriental Fruit Moth With Methyl Bromide, by L. A. Hawkins (E-458); Prevention of Insect Damage to Wind-Thrown Timber in the New England States, by F. C. Craighead (E-459); Technique and Equipment for Handling Two Hymenopterous Parasites [*Microgaster tibialis* Nees and *Eulimneria alkae* Ell. and Sacht.] of the European Corn Borer, With Particular Reference to Prolonging their Hibernation, by K. D. Arbuthnot and W. A. Baker (E-460); The Plant Quarantine Act and Quarantine No. 37, by L. A. Strong (E-461); The Gladiolus Thrips and Its Control, by R. H. Nelson and C. A. Weigel (E-462); A Digest of the Literature Through 1934 Relating to Insecticidal Spray Residues, by R. L. Busbey (E-463); Biology of the White-Fringed Beetle *Naupactus leucoloma* Boh., by H. C. Young and B. A. App (E-464), which supersedes E-420 (E. S. R., 79, p. 369); Some Results of Recent Work With Dried-Fruit Insects, by P. Simmons, D. F. Barnes, C. K. Fisher, and G. H. Kaloostian (E-465); The Use of Fluorine Compounds as Insecticides—A Review With Annotated Bibliography, by R. H. Carter and R. L. Busbey (E-466); Chemicals and Methods Used in Treatments of Trees by Injections, With Annotated Bibliography, by R. H. Carter (E-467); and The History of the Use of Derris as an Insecticide—II, The Period 1919–1928, by R. C. Roark (E-468) (see page 244).

Review of United States patents relating to pest control, [January–December 1938], R. C. Roark (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Rev. U. S. Pat. Relat. Pest Control, 11 (1938), Nos. 1, pp. 9; 2, pp. 8; 3, pp. 14; 4, pp. 11; 5, pp. 10; 6, pp. 8; 7, pp. 10; 8, pp. 11; 9, pp. 9; 10, pp. 8; 11, pp. 10; 12, pp. 11*).—A continuation of this series (E. S. R., 78, p. 817).

Factors concerned in the deposit of sprays, V, VI. (Univ. Calif.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 57–69, figs. 5*).—This continuation of the studies (E. S. R., 80, p. 798) is presented in two parts.

V. *The effects of pH upon the deposit of the oil and water phases of oil emulsions*, G. T. Brown and W. M. Hoskins (pp. 57–61).—It was found that the deposit of oil upon a standard beeswax surface "from emulsions containing sodium

oleate or triethanolamine oleate is decreased by changing the pH from 2.5 to 7.5. Upon further changing the pH to 10 the deposit is greatly increased except when large amounts of the soaps are present. When hemoglobin is used, the oil deposit increases with pH throughout the range. With all three accessory substances the total amount of oil emulsion deposited increases as the pH rises. Attention is called to the importance of pH control in practical spraying."

VI. *The role of electrical charges produced during spraying*, E. L. Wampler and W. M. Hoskins (pp. 61–69).—This work is in continuation of the earlier studies noted (E. S. R., 75, p. 224). "Electrical charges are produced on droplets by the rupture or atomization of liquid columns as well as by impact and splashing of droplets against a surface. The rolling of droplets and sliding of films of liquid over surfaces also produce charges thereon. . . . Spray droplet charge is directly proportional to spraying pressure and inversely proportional to electrolyte concentration. On sprayed beeswax surfaces charge varies greatly both in sign and magnitude, depending on kind and amount of electrolyte present and upon hydrogen-ion concentration of the spray. Wetting of the wax surface occurred when aluminum nitrate was present in certain concentrations in the spray suspension, but this wetting would not take place unless the pH of the solution was properly adjusted. A mechanism is suggested whereby aluminum ion operates to produce wetting. When wetting occurred, the magnitude of charge upon the sprayed surface decreased steadily as wetting progressed, and at complete film formation the charge always reached a minimum value. This charge-wetting relationship held for several wetters of widely divergent chemical composition. Deposit of lead arsenate is related to degree of wetting but not to charge upon spray droplets or sprayed surface. The results obtained when plant leaves were sprayed closely paralleled those with beeswax surfaces. Retention of lead arsenate upon the beeswax surface could not be increased by charging spray droplets and sprayed surface with external potentials of unlike sign, and wetting was likewise unaffected. Wetting controls deposit, and in its absence deposit is low. There is no relation between the deposit of lead arsenate, total charge of the spray droplets, nor total charge of the sprayed object."

Mechanical and other factors affecting oil spray deposits, G. S. Hensill and V. J. Tihenko (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 36–40*).—A discussion of mechanical and some other factors affecting spray deposits and data on the effects of some of these factors on deposits are presented. More oil per unit of area was deposited on natural surfaces than on artificial surfaces. By keeping close checks on the apparatus and other factors concerned with spray application, it was found possible to obtain close results in different tests.

Hydrocyanic acid gas in the vacuum fumigation of broom corn under winter conditions, L. S. McLaine and H. A. U. Monro (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 94–98*).—The work reported has shown that larvae of the European corn borer chilled for varying periods up to a maximum of 21 days at a temperature of 10° F. are still susceptible to vacuum fumigation with hydrocyanic acid gas provided they are warmed prior to treatment for a period of 24 hr. at a temperature of not less than 50°. "The commercial treatment of European broom corn based upon these findings calls for a dosage of 2.5 lb. of hydrocyanic acid gas per 1,000 cu. ft. of tank space acting in a sustained vacuum at an absolute pressure of approximately 2.5 in. of mercury for a period of not less than 3 hr. The commodity temperature required is one of not less than 60° in any part of the bales; the vault temperature is maintained at 80° to 90° with the aid of heating coils."

Basic copper arsenate: A new insecticide, I, II. (Ohio State Univ.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 142–146*).—In the first part of this con-

tribution chemical and physical studies are reported by E. D. Witman, H. A. Waters, and E. F. Almy (pp. 142–144). In the second part insecticide and phytotoxicity studies are reported by H. A. Waters, E. D. Witman, and D. M. DeLong (pp. 144–146). The authors are led to recommend basic copper arsenate as a new insecticide-fungicide material. Its principal chemical and physical properties are described, and the results of tests with the Mexican bean beetle, Colorado potato beetle, southern armyworm, velvetbean caterpillar, fall webworm, and catalpa sphinx, with which it proved fully as effective as acid lead arsenate or calcium arsenate, are reported. "Basic copper arsenate has a slower initial effect and a more rapid final effect on the insects tested than lead arsenate. This property increases the chance that gross feeding insects will ingest a toxic dose before the poison causes feeding to cease. Because of its low soluble As_2O_5 value and its stability, basic copper arsenate is much safer on most types of plant foliage than are other commercial arsenicals. In basic copper arsenate the factor of lead and lead residues is eliminated and the copper factor is introduced, which gives the material decided promise as a fungicide."

The early history (1848–1918) of the use of derris as an insecticide, R. C. Roark. (U. S. D. A.). (*Pests, 6 (1938), No. 12, pp. 8–10*).

Seasonal variation in the distribution of two species of Symphyla found in California, A. E. Michelbacher. (Univ. Calif.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 53–57, figs. 6*).—Population trends of *Scutigerella immaculata* (Newp.) and *Symphylella subterranea* Michelb., which have markedly different reactions, are considered.

Laboratory evaluation of soil poisons used in termite control, G. L. Hockenyos (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 147–149*).—A description is given of a simple method of evaluating termite soil poisons. "Trichlorobenzene and polychloropentane are shown to be much superior to the orthodichlorobenzene now commonly recommended. Sodium arsenite and arsenate were the best of the inorganic compounds tried. Sodium pentachlorophenate is highly toxic and repellent, but seems to be easily removed from its water solution by the soil."

The common termite and the dry-wood termite in Puerto Rico [trans. title], G. N. Wolcott, trans. by F. Seín, Jr. (*Puerto Rico Col. Sta. Bul. 48 (1939), Span. ed., pp. 26, figs. 13; Eng. abs., p. 26*).—Brief accounts are given of the only 2 of the 16 species of termites known to occur in Puerto Rico that have received popular names, namely, *Nasutitermes costalis* Holmg. (=*N. morio* Latr.), the common termite, popularly known as "comején," and *Cryptotermes brevis* Walk., the dry-wood termite, popularly known as "polilla." Mention is also made of *Heterotermes tenuis* Hagen and *H. convexinotatus* Snyder, also of economic importance in the island.

The regional and seasonal incidence of grasshopper plagues in Australia, K. H. L. Key (*Austral. Council Sci. and Indus. Res. Bul. 117 (1938), pp. 87, figs. 14, map. 1*).—In this contribution all the available information regarding grasshopper plagues in Australia is brought together and presented as a history of the plagues, special attention being paid to the correct identification of the species involved and to seasonal and geographical distribution. The species of major economic importance, *Chortoicetes terminifera* Walk., and *Austroicetes cruciata* Sauss., are first considered (pp. 13–75), followed by an account of the species of minor economic importance, namely, *Gastrimargus musicus* F., *Austacris guttulosa* Walk., *Phaulacridium vittatum* Sjöst., *Oedaleus australis* Sauss., *Locusta migratoria* L., *Brachyexarna lobipennis* Sjöst., and *Praxibulus laminatus* Stål. and *Urnisa* sp. and *Peakesia* sp.

A list is given of 66 references to the literature.

Problems of growth of the African migratory locust, A. J. Duarte (*Bul. Ent. Res., 29 (1938), No. 4, pp. 425–456, figs. 12*).—This account of the African migratory locust *Locusta migratoria migratorioides* (R. & F.) is presented with a list of 16 references to the literature.

Thrips of economic importance in California, S. F. Bailey (*California Sta. Circ. 346 (1938), pp. 77, figs. 40*).—Following a brief introduction, general description of thrips, identification of species (including a key to those of economic importance in California), general biology and habits, distribution and injury, and control, summarized accounts are given of those of major importance in the State. Included are the pear thrips, California flower thrips *Frankliniella moultoni* Hood, bean thrips, citrus thrips, onion thrips, gladiolus thrips, greenhouse thrips, grape or vine thrips *Drepanothrips reuteri* Uzel, California toyon thrips *Rhynchothrips ilex* (Moulton), hollyhock thrips *Liothrips varicornis* Hood, lily thrips *L. vaneeckei* Pr., sugar beet thrips *Hercothrips femoralis* (Reut.), and the composite thrips *Microcephalothrips abdominalis* (Crawf.). Brief mention is made of several other species for which there are no common names in general use and which are of minor importance, occurring mostly on ornamentals and in greenhouses. Other thrips of economic importance in North America that do not occur in California are noted, and a selected list is given of references to the economic forms, arranged according to species.

The six-spotted thrips Scolothrips sexmaculatus (Perg.), S. F. Bailey. (Univ. Calif.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 43–47, fig. 1*).—An account is given of the economic importance, distribution, and taxonomic position, and a description of the stages of the six-spotted thrips *S. sexmaculatus*. This is one of the oldest species of thrips known to North America, but its life history has remained unknown.

Sprays control prune thrips, S. C. Jones. (Oreg. State Col.). (*Better Fruit, 33 (1939), No. 9, pp. 3, 16, figs. 2*).

The effect of thrips injury on production in cotton, R. K. Fletcher and J. C. Gaines. (Tex. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 78–80*).—The loss suffered in a field of cotton in the Brazos River Bottoms in Burleson County, Tex., severely injured by the flower thrips, was calculated to be 358 lb. of seed cotton per acre. Many of the plants were killed in this field. In 12 bottomland fields the estimated average loss was 107 lb. and in 2 upland fields 61 lb. Attack results in a smaller size of boll, a smaller number of bolls per plant, and late opening of the bolls.

Control of plant bugs in citrus groves, J. R. Watson. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 10, pp. 12, 13*).—A practical account.

Toxicity of hydrogen cyanide, chlorpicrin, and ethylene oxide to eggs, nymphs, and adults of the bedbug, H. Gunderson and A. L. Strand. (Mont. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 106–110, figs. 3*).—The variations among stages and among fumigants as used against the bedbug are shown in the experiments here reported. "No conclusions may be drawn as to the action of ethylene oxide and chloropicrin on bedbug eggs. It is shown that hydrogen cyanide is from 2 to 48 times as toxic as the other gases used. Bedbug eggs are less resistant to hydrogen cyanide and ethylene oxide than are nymphs and adults. The eggs are apparently much more resistant to chloropicrin than are nymphs and adults. Nymphs and adults of the bedbug are very similar in their reactions to the fumigants used in these experiments."

The glasshouse leaf-hopper, Erythroneura pallidifrons Edw., G. Fox Wilson (*Jour. Roy. Hort. Soc., 63 (1938), No. 10, pp. 481–484, pls. 2*).—A dis-

cussion of the biology and control of *E.* (*Zygina*) *pallidifrons*, which has become of increasing importance as a pest of greenhouse plants in Great Britain in recent years.

Breeding areas and economic distribution of the beet leafhopper in New Mexico, southern Colorado, and western Texas, V. E. Romney (*U. S. Dept. Agr. Circ. 518 (1939), pp. 15, figs. 3*).—Surveys made during the period extending from June 1928 to January 1936 have led to the location and mapping of breeding areas of the beet leafhopper that occur along the Rio Grande drainage in southern New Mexico and western Texas. A perennial mustard (*Lepidium alyssoides*) was found to serve as the host for from 85 to 90 percent of the first- and second-brood leafhoppers that move during May and June each season to infest distant agricultural districts east of the Continental Divide. These districts were separated into zones of infestation by using as a basis the degree of curly top infection found in sugar beets from 1928 to 1933. The degree of infestation to which these districts were subjected from year to year was found to vary with host plant conditions in the breeding area. Economic infestations by the leafhopper in fall and winter crops in the Mesilla Valley occurred only during fall seasons when there were practically no perennial or germinated mustard plants in the sandy foothills and when large leafhopper numbers resulted from favorable summer host conditions.

Field experiments for control of the beet leafhopper in Idaho, 1936–37, J. R. Douglass, C. Wakeland, and J. A. Gillett. (U. S. D. A. and Idaho Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 69–78, figs. 9*).—Of the insecticides tested, pyrethrum was the only one found to be specific against the beet leafhopper. The results indicate that the 50:1 and 40:1 ratios of oil to pyrethrum are too large, and that best results were obtained at ratios of 25:1 and 30:1. "In general the percentage kill increased as the pyrethrum content increased. The percentage kill increased as the per-acre application increased from 5 to 6 to 7 to 8 gal. Disease counts showed no significant difference between the various treated and untreated plats. No correlation was found between the yield obtained and the spray applied. This was to be expected because the beet leafhoppers were found to redistribute themselves over the plats following each spray application. U. S. 12, a resistant variety to curly top, produced a fairly satisfactory yield under a very high degree of leafhopper infestation. The spring movement of this insect from the desert to the cultivated area extends over a period of from 12 to 36 days. The period of migration coincides very well with the seedling stage or the period of susceptibility of the plant."

The effect of temperature upon egg deposition, egg hatch, and nymphal development of Paratrioza cockerelli (Sulc), G. M. List. (Colo. State Col.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 30–36*).—Studies conducted during the winter of 1935–36 in an effort to measure the effect of certain temperatures and combinations of temperatures on the development of the several stages of *P. cockerelli*, the most serious pest of tomatoes and potatoes in Colorado, are reported, the details being given in tables.

Notes on the insect enemies of Chermes, with particular reference to Pineus pini Koch and P. strobi Hartig, F. Wilson (*Bul. Ent. Res., 29 (1938), No. 4, pp. 373–389*).—The insect predators of pine *Chermes* are listed, and a brief account is given of the life history of the more important, particularly *P. pini* and *P. strobi*.

Time of fumigation of aphid infested canning peas and resistance of the plants to subsequent infestation, E. M. Searls. (Univ. Wis.). (*Jour.

Econ. Ent., *32 (1939), No. 1, pp. 90–93, fig. 1*).—Data presented indicate that normally aphid-susceptible canning peas become "uncongenial hosts to the aphids and cause them to start producing alate forms for migration at about the time that the peas come into blossom. When the aphid population is destroyed at this time, the naturally uncongenial nature of the peas inhibits the normal increase of aphid numbers on subsequent infestation. It is also indicated that, if the aphid infestation upon the peas is destroyed after the fourth week before the usual canning stage, the aphids will not have time to increase to destructive numbers before the peas are harvested for canning."

Hemipterous insects of cotton in Arizona: Their economic importance and control, T. P. Cassidy and T. C. Barber. (U. S. D. A.). *Jour. Econ. Ent.*, *32 (1939), No. 1, pp. 99–104, fig. 1*).—Notes are presented on some 15 species of hemipterous insects that feed and breed in Arizona on cotton plants and cause losses in quality and yield of lint. It is pointed out that many of the 53 species of Hemiptera met with in cotton fields of the State are apparently harmless and a few are beneficial as predators.

The silkworm and silk production (*Die Seidenspinner, ihre Zoologie, Biologie, und Zucht. Berlin: Julius Springer, 1938, pp. VII+171, figs. 144*).—Part 1 of this work, by F. Bock, deals with the zoology and biology of the silkworm (pp. 1–145) and part 2, by L. Pigorini, with silk culture (pp. 146–166).

Plutella maculipennis Curt., its natural and biological control in England, J. E. Hardy (*Bul. Ent. Res.*, *29 (1938), No. 4, pp. 343–372, pl. 1, figs. 10*).—A brief introduction and a description of the life history and distribution of the diamondback moth are followed by an account of its biology and interrelation of its parasites in England and its natural control. Preliminary work with its natural enemies indicates that two parasites, *Angitia cerophaga* and *A. fenestralis*, constantly parasitize large numbers of the larvae. The collecting and breeding of these parasites for introduction into New Zealand is under way. A list is given of 16 references to the literature.

Laboratory studies of poisoned baits for the control of the southern armyworm, C. B. Wisecup and L. B. Reed. (U. S. D. A.). (*Fla. Ent.*, *21 (1938), Nos. 3, pp. 38–47; 4, pp. 62, 63*).—In laboratory work corn meal and cottonseed meal were found to be good substitutes for each other in southern armyworm baits. Lemon was found of no value; sirup definitely increased the effectiveness. The presence of natural food decreased the mortalities obtained with the baits, demonstrating the desirability of supplying this insect with an abundance of natural food when testing baits if the results are to be useful. Cryolite was the only poison that gave satisfactory results in any combination in the presence of natural unpoisoned food, with paris green second in effectiveness. Cube was worthless, while phenothiazine gave some mortality and in view of its safeness may be considered promising when used at a relatively high rate.

Insecticide tests for the control of the bollworm in 1936, R. W. Moreland and J. C. Gaines. (U. S. D. A. and Tex. Expt. Sta.). (*Jour. Econ. Ent.*, *32 (1939), No. 1, pp. 104–106*).—Tests conducted indicate that "calcium arsenate, calcium arsenate plus paris green (5 and 10 percent), calcium arsenate plus cube (containing 0.8 percent rotenone), and calcium arsenate plus 50 percent sulfur were equally effective against the bollworm. All plats received calcium arsenate in the foregoing mixtures at the rate of 7.76 to 9 lb. per acre. When the rate of application of calcium arsenate was reduced to 7 lb. per acre, as in the calcium arsenate plus lime mixture, the yield was likewise reduced. Pyrethrum dust (containing 0.09 percent pyrethrins I and II) with sulfur as a carrier did not prove effective against these pests. These results agree with

previous reports concerning this problem, namely, that calcium arsenate applied at the rate of from 8 to 9 lb. per acre proved to be the most effective and economical insecticide for the control of the bollworm."

Control of the corn earworm on Fordhook lima beans in eastern Virginia, L. W. Brannon. (Coop. Va. Truck Expt. Sta.). (*U. S. Dept. Agr. Circ. 506 (1939), pp. 15, figs. 2*).—The results of experiments conducted with the corn earworm from 1935 to 1938, inclusive, on the eastern shore of Virginia, where it frequently causes severe damage to the fall crop of Fordhook lima beans after corn in the vicinity has dried out and is no longer attractive to the moths for egg deposition, are reported. The damage is caused by the feeding of the earworm on the pod through the wall of which it makes a round hole and often completely devours the contents. This injury causes many of the young pods to shed and necessitates hand culling of the damaged pods prior to marketing the crop. The experiments have shown that this damage may be appreciably reduced by the application of "cryolite dusts or sprays, the former being applied either as an undiluted dust or at the rate of 60 parts to 40 parts of talc or sulfur by weight and the latter at the rate of 3 lb. in 50 gal. of water. It was found that in addition to giving a high degree of control of the insect on pods remaining on the plants at harvest, applications of these materials caused increases in the number of pods produced compared with the untreated plats, showing that injury and resultant shedding of young or immature pods was prevented. In order to secure thorough coverage of all parts of the plants the insecticide should be directed to both the upper and lower surfaces of the leaves. A bait composed of 1 lb. of cryolite to 25 lb. of corn meal, broadcast evenly over the leaves of the plants at the same time intervals as for dust or spray applications, is also effective for control of this insect on lima beans. Treatments should be begun when the majority of the silks on ears of field corn in the vicinity of late plantings of lima beans have dried out, or not later than such time as the lima bean plants under observation are in full bloom. Three or four treatments are usually necesssary, depending on the abundance of the insect. In order to avoid the danger of harmful fluorine residues on the edible portions of the market product treatments should be discontinued 2 weeks prior to harvest." The results of analyses of samples of shelled beans following treatment with cryolite talc dust have shown the grains of fluorine present per pound to come in most cases within the tolerance limit established for fluorine on fruits. With canned lima beans the grains of fluorine per pound present were well below the tolerance established for fluorine on fruits, indicating that the ordinary washing process in the commercial canning of the crop effectively removes harmful fluorine residues deposited through outside agencies.

Inactivation of pyrethrum after ingestion by the southern armyworm and during incubation with its tissues, P. A. Woke. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 4, pp. 289–295*).—An investigation aimed at determination of the reason for the inactivity of the toxic principles of pyrethrum and their resulting failure to act when ingested by the southern armyworm is reported. To this end pyrethrum was fed to the larvae in turnip-leaf sandwiches, and later the tissues, gut contents, and feces were ground and tested against mosquito larvae for the presence of toxic principles. In order to determine the kind of tissues that might be responsible for such inactivation the pyrethrum was mixed with the various tissues and the gut contents from healthy larvae and incubated at 29° C. in the dark for 18 hr. Half of the material was agitated during incubation, and the material was then tested against mosquito larvae for the presence of toxic principles. *The results indicate that the toxic principles of pyrethrum*

may become inactivated, wholly or in high degree, after ingestion by the southern armyworm. The tissue of the digestive tract and the gut contents may reduce the toxicity of unextracted pyrethrum little or none, and of extracted pyrethrum only partially. The blood may have little or no effect on the toxicity. The skin and muscle tissues may greatly reduce the toxicity of agitated extracted pyrethrum, but only partially reduce the toxicity of unagitated extracted pyrethrum and of either unagitated or agitated unextracted pyrethrum. The fat body may reduce the toxicity of unextracted pyrethrum partially and of extracted pyrethrum greatly, even when these materials are not agitated, but the toxicity of both when agitated with fat body during incubation may be very greatly reduced.

A list is given of 15 references to the literature cited.

The European corn borer assumes increased importance, G. E. R. Hervey and L. A. Carruth (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 2*, *pp. 6*, *11*, *figs. 3*).—With the gradual spread of the two-generation form of the European corn borer during the past 8 or 9 yr. from New England, where it was discovered 20 yr. ago, westward into New York State, where the one-generation form was found about the same time as the New England infestation, this pest has mounted in importance. Long Island and the Hudson Valley as far north as Saratoga and Schenectady Counties have become areas of severe infestation in the State, which include approximately 15,000 acres of sweet corn. Traces of the two-brooded form in the vicinity of Syracuse and in parts of Oswego and Jefferson Counties were reported during the season of 1938. In the area of severe infestation in eastern New York during the season 1938 much of the early sweet corn harvested in July was worthless because of borer injury. Many of the fields were from 80 to 100 percent infested and 10 or more borers were frequently found per plant. Medium early corn was relatively free from injury, while late corn or that harvested after the first of September was about as seriously infested as the early corn. Control work now under way includes the introduction of parasites, breeding of resistant varieties of corn, and the development of insecticides. It was found in 1938 that powdered derris root containing 5 percent rotenone used at the rate of 4 lb. to 100 gal. of water with a suitable spreader gave very good control. "Four to five treatments were necessary to protect the rapidly growing corn plants during the egg-laying season. The treatments were distributed over a period beginning when the first eggs started to hatch and extending until shortly after egg laying reached a peak. Certain fixed nicotine dusts and sprays also reduced borer population but were less efficient than the derris spray." The importance of community cooperation in clean-up practices, which include disposal of corn remnants by plowing or burning, is emphasized.

Occurrence and responses of a partial second generation of the European corn borer in the Lake States, A. M. Vance. (U. S. D. A.). (*Jour. Econ. Ent.*, *32* (*1939*), *No. 1*, *pp. 83–90*, *fig. 1*).—Investigation has revealed an increase in recent years in the proportion of the European corn borer producing two generations annually in southeastern Michigan, northwestern Ohio, and northeastern Indiana. In the 10 counties of northeastern Indiana surveyed in the fall of 1937, 28 percent of the larvae observed were sufficiently immature to indicate they belonged to a second generation, and as high as 8.7 percent of the larvae in early sweet corn surveyed in the vicinity of Toledo in the summer of the same year pupated late in July and early in August and produced moths which deposited their eggs during August. This recent noticeable occurrence of a partial second generation in the Lake States is considered to be the result of cumulative climatic influences rather than the more immediate weather effects of any single season in itself.

Toxicity to the codling moth larva of derivatives of benzene containing halogen and nitro groups, E. H. Siegler, F. Munger, and L. E. Smith. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 129–131*).—The results of tests of halogenated benzenes, nitrobenzene, monohalogenated nitrobenzenes, dihalogenated benzenes (except difluoro), and dinitrobenzenes and of initial and residual tests of *p*-iodonitrobenzene against the larva are reported in detail in tables. Among the derivatives tested "*p*-iodonitrobenzene, *m*-iodonitrobenzene, *p*-bromonitrobenzene, and *m*-dinitrobenzene gave an initial toxicity of less than 50 percent of wormy plugs. In residual tests *p*-iodonitrobenzene lost most of its effectiveness in 5 or 6 days. The data obtained indicate no marked correlation between either the groupings involved or their relative position with regard to their toxicity to the codling moth larva."

Hybridization experiments with Anopheles maculipennis, M. Bates (*Amer. Jour. Hyg., 29 (1939), No. 1, Sect. C, pp. 1–6*).—The results of crosses of *A. maculipennis*, made in all cases with *A. atroparvus* males, are reported.

Pyrethrum and oils for protection against salt-marsh sand flies (Culicoides), J. B. Hull and S. E Shields. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 93, 94*).—The results of laboratory and practical tests have shown the following to be the most effective combinations for ridding sand flies from houses: One part pyrethrum extract concentrate (20 to 1) and 20 parts lubricating oil (S. A. E. 5) or 1 part pyrethrum extract concentrate (20 to 1), 6 parts kerosene, and 12 parts lubricating oil (S. A. E. 10). "These combinations should be evenly and thoroughly applied to the door and window screens with a brush or rag. The rooms should then be well sprayed with standard pyrethrum extract spray, such as is commonly employed against flies and mosquitoes, to kill sand flies already inside."

The introduction into Puerto Rico of beneficial insects to aid in the control of the horn fly of cattle, K. A. Bartlett (*Puerto Rico Sta. Agr. Notes No. 88 (1939), pp. 6*).—As an aid in the control of the horn fly, which is a serious pest of cattle and horses on the south coast of Puerto Rico, several of its natural enemies have been introduced into the island. These include a number of species of dung beetles, which destroy the breeding places of the horn fly, and a hymenopterous parasite, *Spalangia philippinensis* Full., from Hawaii, which attacks the puparia. The dung beetles introduced are *Canthon pilularius* and *Phaenus triangularis* from Texas and *Copris incertus prociduus* and *Onthophagus incentus* from Hawaii.

Mention is also made of several native parasites of the housefly and stablefly reared from field-collected hornworm puparia, namely, *Spalangia muscidarum* Rich., *Ashmeadopria* n. sp., *Pachycrepoideus dubius* Ashm., and *Muscidifurax raptor* Gir. and Sand.

The olfactory responses of flies in a new type of insect olfactometer.—II, Responses of the housefly to ammonia, carbon dioxide, and ethyl alcohol, J. O. G. Wieting and W. M. Hoskins. (Univ. Calif.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 24–29, fig. 1*).—In this further contribution (E. S. R., 72, p. 367) an olfactometer suitable for use with houseflies is described. "It depends upon streams of air heated to 41° C. to attract the flies to the test and check areas. Concentration of the substance to be tested is controlled by the use of flowmeters and saturating chambers. The results show that mixed groups having a sex ratio of approximately unity are attracted to ammonia at a concentration of 0.012 percent by volume but are strongly repelled at concentrations greater than 0.03 percent. Carbon dioxide has no appreciable effect up to about 2 percent. Ethyl alcohol attracts feebly at 0.012 percent and repels

above about 0.05 percent. With separated sexes, females are more strongly attracted than males to ammonia and the reverse is the case with ethyl alcohol."

The larvae of Agromyzinae [trans. title], J. C. H. DE MEIJERE (*Tijdschr. Ent., 80 (1937), No. 3–4, pp. 167–243, figs. 94; 81 (1938), No. 1–2, pp. 61–116, figs. 60*).—A continuation of the account previously noted (E. S. R., 78, p. 358).

A new method of feeding adult horn flies (Haematobia irritans L.) and stable flies (Stomoxys calcitrans L.), W. G. BRUCE and C. EAGLESON. (U. S. D. A.). (*Jour. Kans. Ent. Soc., 11 (1938), No. 4, pp. 144, 145, fig. 1*).—A description is given of a rapid, inexpensive, and satisfactory method of feeding horn and stable flies that has been developed. It consists in providing blood in glass tubes and the utilization of the insects' positive phototropism.

[Contributions on the apple fruit fly], F. H. LATHROP (*Maine State Pomol. Soc. Ann. Rpt., 1934–35, pp. 12, 13, 38–41*).—Contributions on The Apple Fruit Fly Problem (pp. 12, 13) and Investigation of the Apple Fruit Fly, 1935 (pp. 38–41) are presented.

The feather-legged fly, H. E. BRATLEY. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 9, pp. 13, 14*).—A brief account of a tachinid parasite of plant bugs of economic importance in Florida.

Further fly parasites of Dysdercus, C. H. T. TOWNSEND (*Rev. Ent., 8 (1938), No. 3–4, pp. 347, 348*).—Four species of dipterous parasites of cotton stainers in Brazil are described as new under the names *Paraphorantha politana*, *Alophoropis brasiliensis*, *Euphorantha dysderci*, and *Phoranthella mendesi*.

A nutritional study of the larva of Dermestes vulpinus F., F. J. GAY (*Jour. Expt. Zool., 79 (1938), No. 1, pp. 93–107, figs. 4*).—It has been found that the hide beetle, which normally feeds on foods of high protein content, can be reared from the egg to adult stage on a diet of casein, cystine, cholesterol, yeast and salts, or yeast, cholesterol, and salts. Cholesterol is essential for normal growth. Vitamin B (undifferentiated complex) also appears to be necessary. The salts contained in brewers' yeast are satisfactory for growth. The hide beetle can develop on low concentrations of cystine.

Control of the flatheaded apple tree borer in Oklahoma, G. V. JOHNSON and F. A. FENTON. (Okla. A. and M. Col.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 134–142*).—The findings in control work with the flatheaded apple tree borer in Oklahoma are summarized as follows:

"Results from stomach poisons tested indicate that heavy applications of arsenical sprays are necessary to obtain good kills of the adult. Because of the activity of the beetles, it is believed spraying a small area will not protect trees. Repellent paints applied to growing apple trees reduced the number of parasitized borers by 33 percent. A method of testing repellent mixtures by exposing cuttings in trees frequented by the adult borers was devised. Walnut cuttings were more heavily infested with borers than apple cuttings exposed at the same time. Creosote, paradichlorobenzene, and carbolic acid were injurious to the bark of apple and walnut. Paraffin alone gave nearly as good repellence as paraffin and paradichlorobenzene, and did no injury to the wood. Most promising repellents are carbolineum preparations, paraffin, and a naphthalene-flour-soap preparation. Materials tried as fumigants to kill the borer in the larval stage were ineffective. Protecting trees with a paper wrap materially reduced the number of trees killed by borers, but when wraps were applied to the trunk the beetles shifted their attack to the limbs above the wrap. Paper wraps rotted away near the ground and needed attention at this point, especially when the trees were watered frequently."

Wireworm damage to potatoes in the Yakima Valley of Washington, K. E. Gibson. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 121–124, fig. 1*).—In the studies reported it was shown that wireworm injury to potatoes is in a general way related to the number of wireworms in the soil, although other factors than numerical abundance of these pests may have considerable effect on their depredations. "No definite forecast of the damage that may be incurred can be made on the basis of wireworm population, but it seems that with a population of 0.5 wireworm per square foot approximately 25 percent of the crop may be damaged. The injury will rise with increasing numbers of wireworms until after six or seven wireworms per square foot are found, when the added damage may be relatively little."

Trapping elaterid beetles as a control measure against wireworms, R. E. Campbell and M. W. Stone. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 47–53, figs. 2*).—Attempts to trap adults of elaterid beetles led to the conclusion that piles of plant material to provide traps for *Limonius californicus* cannot be used successfully as an aid in its control, at least not under conditions existing in southern California.

Larval development of the native elm bark beetle (Hylurgopinus rufipes (Eich.)) in Massachusetts, W. B. Becker. (Mass. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 112–121, figs. 13*).—It appears from the count made of cast larval skins in several galleries of the native elm bark beetle that there may be a variation in the number of stadia of this pest. "The results obtained, however, by plotting on graphs the size distribution of the head widths of one generation of larvae which were collected at approximately weekly intervals indicate that five stadia occurred most commonly under the conditions of the experiment. The results also indicate an overlapping in the sizes of the head widths of successive larval instars and allow for a variation from this number of instars for some of the larvae. In addition, because the species is monogamous and the sexes are almost equal in number and because there is a difference in the size distribution of the head widths of the male and female adults, the data suggest the possibility that a difference in size distribution due to sex may begin to become noticeable in the last two instars. The possibility of such a difference in size, however, is not determined by this experiment. Evidence of a more definite nature is required."

Effect of sun-light and of location of logs on the beetle infestations of elm logs, C. H. Martin. (Cornell Univ.). (*Bul. Brooklyn Ent. Soc., 33 (1938), No. 4, pp. 195–201, pls. 2*).—It was found that *Hylurgopinus rufipes* (Eich.) and *Scolytus multistriatus* Marsham infestations in logs in a ladderlike arrangement and of logs suspended 35 to 40 ft. above the ground did not differ significantly, indicating that both species infest logs near the ground as readily as those high above it. "*H. rufipes* infestations of the logs of these two experiments did not differ significantly from those of the check logs which were 3 ft. off the ground and in less sunlight than the logs of the experiments, and it was inferred that the *H. rufipes* infestation depends to a greater extent upon the proximity of the log to the hibernating quarters of this species. On the other hand, when *H. rufipes* infestation was low, *S. multistriatus* infestations of the experimental logs did differ significantly from those of the check logs, indicating that an increase in sunlight caused a corresponding increase in the infestation of this species. The clearing of trees around a deep-shade station so as to increase the amount of sunlight falling on the logs brought about a marked increase in *S. multistriatus* infestation."

The native elm bark beetle (Hylurgopinus rufipes (Eichhoff)) in Connecticut, B. J. Kaston (*Connecticut [New Haven] Sta. Bul. 420 (1939), pp. 39, figs. 19*).—The results of work reported in earlier contributions by the author

(E. S. R., 76, pp. 64, 224; 77, pp. 75, 813; 79, p. 359; 80, p. 81) and later findings on the life history and habits of the native elm bark beetle, which is of importance as a disseminator of the causative fungus of Dutch elm disease and much more abundant in the State than the smaller European elm bark beetle, are first presented, the details being given in tables and figures. The natural factors of control and the associated fauna are then considered, followed by a brief summary and a bibliography of 41 references.

Studies in population physiology.—VIII, The effect of larval population density on the post-embryonic development of the flour beetle Tribolium confusum Duval, T. Park (*Jour. Expt. Zool., 79 (1938), No. 1, pp. 51–70, figs. 3*).—A further contribution in this series of studies (E. S. R., 78, p. 82).

Notes on the biology of the cotton pruner Chalcodermus bondari Marshall, L. Pyenson (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 80–83, figs. 4*).—Report is made of observations of the biology of this cotton pest, which has been found damaging the crop throughout the State of Pernambuco, Brazil, and as far south as the Chaco region in Argentina.

Biology and control of the pea weevil in the Palouse area of Idaho and Washington, T. A. Brindley. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 21–24*).—Observations of the biology of the pea weevil and experiments on control measures in the Northwest are briefly reported. The results suggest that further "research on the relationship between the blossoming dates of the border and main field, on the type of plowing equipment used to bury the peas, and the use of insecticides in connection with the borders may make the use of border trap strips a valuable adjunct in pea weevil control."

A new species of Calliephialtes from Brazil, with a key to the Neotropical species (Hymenoptera: Ichneumonidae), R. A. Cushman. (U. S. D. A.). (*Rev. Ent., 9 (1938), No. 1–2, pp. 11–13*).—A parasite of the pink bollworm in São Paulo, Brazil, is described as new under the name *C. dimorphus*. A table for the identification of the seven species of this genus is included.

Suggestions for the control of sawflies on conifers, E. I. McDaniel (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 161–164, figs. 2*).—Practical suggestions are given for the control of sawflies on conifers, particularly the larch sawfly, Abbott's sawfly *Neodiprion pinetum*, the red-headed pine sawfly, and the introduced pine sawfly.

The black widow spider and its parasites, W. D. Pierce (*Bul. South. Calif. Acad. Sci., 37 (1938), No. 3, pp. 101–104, figs. 3*).—A scelionid hymenopteron found to parasitize the egg balls of the black widow spider on the sand dunes at El Segundo, Los Angeles County, Calif., is described as *Baeus californicus* n. sp. Nine of the 38 egg balls collected in cactus clumps on the dunes were parasitized by this new species. Of the 2,420 eggs in the 9 balls 98.55 percent were attacked by this parasite.

Pear bud injury and the pear leaf blister mite, J. F. Lamiman. (Univ. Calif.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 40–43*).—Studies of the biology and means of control of the pear leaf blister mite are reported. The habits of the bud form of this mite, which causes considerable losses in the pear-growing sections of California through winter destruction of fruit buds, are very different from the blister form, although no structural differences have been found. In some sections, especially in the Sierra foothills, harvest is so delayed that control measures cannot be applied before many of the mites have worked deep into the buds. In these areas the addition of 5 lb. of wettable sulfur to the early codling moth sprays was found to provide an adequate check on the activities of the bud form of the pear leaf blister mite.

Observations on the nature of bulb mite attack on Easter lilies, R. LATTA. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 1, pp. 125–128, figs. 5*).—Investigations commenced in 1935 of the bulb mite, which tunnels the stems of Easter lily bulbs at the ground level causing them to lean or break at that point, are reported. In this work the mites failed to produce this injury even though it is often found in commercial practice. It was demonstrated that infestations of this mite are probably present in all lots of Easter lily bulbs. A definite association between mite injured stems and lack of stem roots was observed in thousands of lily plants. The work indicates that an unknown plant disorder is primary to mite injury on stems.

Eriophyid studies, II, H. H. KEIFER (*Calif. Dept. Agr. Bul., 27 (1938), No. 3, pp. 301–323, figs. 18*).—This contribution supplements that previously noted (E. S. R., 80, p. 236), with descriptions of 18 additional mites, 14 of which are new to science. A generic key to the Phyllocoptinae incorporates the two new genera proposed in this article, namely *Calepitrimerus* and *Caliphytoptus*.

ANIMAL PRODUCTION

[Livestock investigations in California] (*California Sta. [Bien.] Rpt. 1937–38, pp. 60–67*).—Studies for which results are briefly reported include the value of supplemental feeding of range cattle; the effect of maintaining pregnant heifers on very low protein rations; the effect of phosphorus deficiency in beef cattle rations; the value of stock beets for fattening lambs; the vitamin B requirements of hogs; the vitamin A requirements of hens; the requirements of poultry for various members of the vitamin B complex, vitamin K, and the anti-gizzard-erosion factor; the value of orange peel and pulp meal, chocolate meal, babassu meal, cull beans, and hempseed meal for poultry; the mode of inheritance of factors influencing egg production in chickens and turkeys; a comparison of various types of turkey rations; and the effect of fish oils and fish meals on the flavor of turkey flesh.

[Livestock investigations in Delaware], A. E. TOMHAVE (*Delaware Sta. Bul. 214 (1938), pp. 14–19*).—Progress reports (E. S. R., 78, p. 518) are briefly noted for the following studies: Dried distillers' and dried brewers' grains for growing fattening pigs, the value of forage crops for pigs, breeding poultry for high egg production and viability, with special reference to the methods of selecting males, protein levels in the rations of growing chicks, broiler production, and the value of artificial light for White Leghorn pullets.

[Experiments with livestock in Florida], A. L. SHEALY, W. G. KIRK, R. M. CROWN, R. B. BECKER, W. M. NEAL, P. T. D. ARNOLD, L. L. RUSOFF, R. W. KIDDER, W. F. WARD, M. E. HAMMOND, L. O. GRATZ, C. H. WILLOUGHBY, N. R. MEHRHOF, and M. W. EMMEL. (Partly coop. U. S. D. A. et al.). (*Florida Sta. Rpt. 1938, pp. 62, 63, 64, 65, 66, 67, 68–72, 170–172, 173, 176–178, 181, 194, 195, 196–198*).—Brief progress reports (E. S. R., 79, p. 519) are presented for the following lines of investigation: The value of purebred sires of various breeds mated to native cows for grading up beef herds and other beef and dual-purpose cattle; mineral deficiencies in feeds used in cattle rations; the feeding value of crotalarias; the efficiency of the trench silo for the preservation of Florida forage crops; the digestibility and feeding value of dried citrus refuse; the comparative value of sugarcane silage, shocked sugarcane, and pasture when supplemented with cottonseed meal or cake for wintering beef cattle; the value of broken ear corn, corn-and-cob and shuck meal, velvetbeans in the pod, ground velvetbeans, and blackstrap molasses in steer fattening rations; the value of Napier grass for pasture purposes; comparative wool production of native, grade Hampshire,

and grade Columbia sheep; the deficiencies of peanut meal when used as a feed for swine; the utilization of citrus meal as a swine feed; and a comparison of various grazing crops for fattening feeder pigs.

From poultry investigations results are noted on breeding for increased livability and egg production, the vitamin content of shark-liver oil, the utilization of citrus byproducts for poultry, egg production and mortality of pullets reared under confinement v. range conditions, the importance of range rotation, the comparative efficiency of different types of brooder stoves, rations for feeding layers in batteries, and the use of peanut products for turkey rations.

[Livestock investigations in South Dakota], J. W. Wilson, B. Aune, and W. E. Poley (*South Dakota Sta. Rpt. 1938, pp. 13–16, 17–22, 40–47*).—Studies on which data are given include a comparison of protein supplements for fattening cattle, the use of sugar beet byproducts in lamb fattening rations when corn and barley were each fed as the principal grain, a comparison of rations for breeding ewes, a comparison of corn, heavy-weight, medium-weight, and light-weight barleys, and ground oats for fattening summer pigs, corn v. ground cane seed for fattening fall pigs, forage crops for spring pigs after weaning, the effect of pasture crop utilization by swine on the quality and palatability of pork, a comparison of high and lower grades of grain in poultry rations, and the relative values of the common grains and their effect on poultry carcass quality, the utilization of corn, wheat, oats, and barley in turkey rations, factors affecting hatchability of turkey eggs, capon production, and the value of millet grains in growing and fattening rations.

[Livestock investigations in Washington] (*Washington Sta. Bul. 368 (1938), pp. 23–25, 28, 29, 67–70*).—Progress results are briefly reported for the following studies (E. S. R., 79, p. 372): The value of cull peas in cattle feeding rations, by H. G. McDonald and H. Hackedorn; the nutritive value of fresh crested wheatgrass and of sweetclover hay, both by J. Sotola; rations for ewes, by Hackedorn and H. P. Singleton; alfalfa meal v. sweetclover meal for bred gilts and the nutritive value of second-year sweetclover forage, both by McDonald; meat storage in community cold-storage lockers, by Hackedorn and W. Burkitt; the protein requirements of laying hens and of chicks, the protein value of various concentrates, fish byproducts in poultry rations, the nutritive requirements of turkeys, and the vitamin requirements of poultry, all by J. S. Carver, E. I. Robertson, J. L. St. John, and J. W. Cook; the effect of heredity and environment on interior egg quality and the effect of storage conditions on egg quality, by L. A. Wilhelm and Carver; the pH of watery white in eggs, by St. John; and the light requirements of laying hens, by Carver and H. L. Garver.

The nutritive values of some forage crops of Puerto Rico.—II, Legumes, grasses, and a mixture, J. H. Axtmayer, G. Rivera Hernández, and D. H. Cook (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 22 (1938), No. 4, pp. 455–481*).—Continuing this line of investigation (E. S. R., 79, p. 668), the digestibility and biological value of Yaraguá and Merker (elephant) grasses and of soybeans and velvetbeans, each in the bloom and full-pod stages, and pigeonpeas in the prebloom stage, were determined in trials with sheep. The data are recorded in detail. The Yaraguá grass proved the least palatable of the various crops studied. The biological value of the proteins of the various legumes ranged from an average of 38 for soybeans in the bloom stage to 63 for soybeans and velvetbeans in the full-pod stage as compared with 84 for Yaraguá grass. The coefficient of digestibility of the different nutrients averaged higher and the nutritive ratio was much narrower for the legumes than for the Yaraguá. The pigeonpeas showed the highest fattening value of all the legumes studied, while the value of Merker grass was far below that of any of the legumes.

The nutritive values of Indian cattle foods and the feeding of animals, K. C. Sen (*Imp. Council Agr. Res. [India], Misc. Bul. 25 (1938), pp. [1]+39*).—This publication presents information on the chemical composition, digestibility, and nutritive value of a wide variety of Indian feeding stuffs.

Sweet clover silage, F. W. Christensen (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 4, pp. 6–8*).—General recommendations for the preparation of silage from sweetclover and from other legumes, grasses, and cereals are set forth. The results of a preliminary trial at the station indicated that the addition of 70 lb. of beet molasses per ton of green clover resulted in a well-preserved silage which was readily consumed by sheep.

The nutritive value of dried tomato pomace, W. B. Esselen, Jr., and C. R. Fellers. (Mass. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 1, pp. 45–47*).—Assays of dried tomato pomace indicated the following vitamin potencies: Vitamin A, 6.8 International Units per gram; vitamin B_1, 8.7 Chase-Sherman units per gram, equivalent to about 4 I. U. per gram; vitamin B_2 (G), 3 Bourquin-Sherman units per gram and 2.8 Cornell chick units per gram; and vitamin C, 1.4 I. U. per gram. These data indicate that this material is a good source of vitamin B_1 and a fair source of vitamins A and B_2.

The vitamin A content of dried citrus pulp, M. C. Futch, L. L. Rusoff, and R. B. Becker. (Fla. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 2, pp. 115, 116, fig. 1*).—Bio-assay of dried citrus pulp (largely from grapefruit canneries) indicated that this product contained less than 0.5 U. S. P. units of vitamin A per gram.

Stability of carotene in green grasses and alfalfa stored at five degrees Fahrenheit, D. W. Bolin. (Idaho Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 2, pp. 111–113*).—Samples of green alfalfa, Kentucky bluegrass, orchard grass, meadow fescue, and bromegrass collected at intervals during the month of July were analyzed for carotene in the fresh state and after storage in the dark at 5° for 10 mo. The alfalfa showed a pronounced loss of carotene during storage (average loss 62.7 percent in one and 70 percent in another), while the grasses stored under like conditions lost little or no carotene, suggesting that a carotene-destroying factor active at 5° was present in alfalfa but not in the grasses.

The effect of different methods of drying on the biological value and digestibility of the proteins and on the carotene content of grass, S. Bartlett, K. M. Henry, S. K. Kon, L. W. Osborne, S. Y. Thompson, and J. Tinsley (*Biochem. Jour., 32 (1938), No. 11, pp. 2024–2030*).—In an experiment at the National Institute for Research in Dairying, the biological value and true digestibility were determined for the proteins of respectively, artificially dried grass (300°) as 67 and 66, for artificially dried grass (170°) 62 and 65, and for sun-cured grass 52 and 64. The differences in the biological value of proteins from artificially dried grasses and hay were highly significant, while other differences were not. Samples of the grass artificially dried at high temperature, at low temperature, and in a current of hot air, sun-cured, and dried without sun at air temperature contained 86.7, 78.1, 89.4, 25, and 31.5 percent, respectively, as much carotene as found in the fresh grass.

A comparative study of the metabolism of certain amino acids, with special reference to respiratory exchange and heat production, M. Kriss. (Pa. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 1, pp. 1–14, fig. 1*).—In a series of balance experiments with male albino rats, four groups of animals received a low nitrogen basal diet supplemented with 2.06 gm. of *d*-glutamic acid, 1.75 gm. of *dl*-alanine, and 2.4 and 1.8 gm. of glycine per animal daily, respectively. These levels of amino acids supplied 7.5, 7.5, 7.4, and 5.6 kg. calories

of gross energy, respectively. The metabolizable energy of the glutamic acid was found to be 80.8 percent of its gross energy, that of alanine 65.68, and that of glycine 64.53 and 67.54 percent at the higher and lower levels. A comparison of these data with those previously presented for certain proteins (E. S. R., 78, p. 520) indicated that the proteins were more completely metabolized than were the single amino acids.

Lactic acid formation by muscles of scorbutic guinea pigs, O. RAHN. (Cornell Univ.). (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 2, pp. 334–336*).—When excised muscles from guinea pigs showing severe scorbutic symptoms were suspended in phosphate buffer containing glucose, about one-half as much lactic acid was produced as by comparable muscle tissue from normal rats, indicating that scurvy had caused a pronounced injury of this enzyme complex. The addition of ascorbic acid directly to the minced muscle had no effect, either in normal or scorbutic muscle, upon the rate or final amount of lactic acid produced.

A study of glycine toxicity, A. R. PATTON. (Univ. Ark.). (*Poultry Sci., 18 (1939), No. 1, pp. 31–34, fig. 1*).—Glycine proved toxic to chickens when the level of ingestion reached a certain point, 1 gm. per day being fed for an extended period without symptoms of toxicity, while 4 gm. per bird daily caused toxicosis within a few days. When 25 gm. of glycine suspended in water was introduced into the crop of a hen, coma and frequently death resulted within 24 hr. Glycine toxicity was not due to high intake of soluble organic matter or soluble nitrogen, as evidenced by the fact that 30 gm. of either glucose or urea were easily tolerated. Other qualitative tests indicated that it was not due to oxalic acid, mehylamine, acidosis, alkalosis, or increased glycine in the blood. The probable cause was an excessive intake of soluble amino nitrogen, since identical toxicity was observed when similar amounts of *dl*-alanine were administered. Symptoms of toxicosis were accompanied by a marked increase in urinary nitrogen, a pronounced decrease in liquid excretion, an increase in concentration of purines, and an increase in size of kidneys with accompanying damage.

The stability of vitamins A and D in mixed feed ingredients.—I, Vitamin D, F. D. BAIRD, A. T. RINGROSE, and M. J. MACMILLAN (*Poultry Sci., 18 (1939), No. 1, pp. 35–39*).—When fortified cod-liver oil was mixed in the chick ration and stored at summer room temperature, assays conducted after 2, 4, 8, 12, 16, and 32 weeks of storage failed to indicate any measurable destruction of vitamin D.

Estimation of the antihaemorrhagic vitamin, H. J. ALMQUIST, E. MECCHI, and A. A. KLOSE. (Univ. Calif.). (*Biochem. Jour., 32 (1938), No. 11, pp. 1897–1903, fig. 1*).—Continuing this line of investigation (E. S. R., 78, p. 377), it was found that the blood clotting time of the chick varies with age, the vitamin K reserve of the chick, and the vitamin K content of the ration. It tended to reach a maximum at 2 weeks of age, while at 3 weeks of age the chick achieved a balance of blood clotting power with respect to the vitamin K content of the ration. The reciprocal of the blood clotting time was found to be a simple linear function of the logarithm of the vitamin K level in the ration, over a practical range of values. An improved assay technic for vitamin K based on these findings is described.

Continuous grazing at Invershiel, H. MACRAE ([*Wilmington, N. C.: Author, 1938, pp. 15, figs. 6*]).—This booklet describes the use of a succession of annual crops which have provided year-round grazing for cattle under conditions prevailing in eastern North Carolina.

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An experiment in beef production in western Canada, A. M. Shaw and J. W. G. MacEwan (*Sci. Agr., 19 (1938), No. 4, pp. 177–198, figs. 9*).—This experiment was initiated in 1930 with 40 cows each of the Galloway, Shorthorn, Hereford, and Aberdeen Angus breeds. All cows were mated to Angus bulls the first year, Herefords the second, Shorthorns the third, and Galloways the fourth, so that purebreds and crossbreds of each group were available for comparison. The Galloway bulls withstood the hardships of the range much better than the other breeds, followed in order by the Herefords, Angus, and Shorthorns. There was little difference in the fertility or in the depreciation due to death and sterility for the four groups of cows. Calves from the Angus cows averaged heaviest at weaning time, followed in order by Shorthorns, Herefords, and Galloways. No single breed or cross was outstanding in feed-lot performance, the Galloway breed consistently making the poorest showing. The crossbreds had a definite advantage over the purebreds in rate of gain and quality of carcass. Reciprocal crosses produced cattle of similar color markings and of about equal quality and utility. Heifer calves of all breeds finished about 30 days earlier than steer calves. Data are reported on an experimental shipment of chilled beef to Great Britain, indicating that this practice offers certain great advantages but that further investigation is needed to overcome many obstacles before such trade could be established.

Wintering steers on different planes of nutrition from weaning to 2½ years of age, W. H. Black, J. R. Quesenberry, and A. L. Baker. (Coop. Mont. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 667 (1939), pp. 20, figs. 5*).—Experiments were conducted at the U. S. Range Livestock Experiment Station, Miles City, Mont., comparing the total gains and feed costs of steers from weaning time to approximately 2½ yr. of age when weaned on three different planes of nutrition. The average gains per steer during the 193 days of winter feeding were 169, 92, and 39 lb. Average gains during the 485 days on summer and fall range were 477, 522, and 571 lb., and total feed and range costs per 100 lb. of gain were $3.11, $2.20, and $1.78 for steers on the high, medium, and low planes, respectively. Thus, while significantly greater gains were attained by steers wintered on a high plane of nutrition, significantly cheaper gains and greater gains during the grazing season were made by steers wintered on the low plane of nutrition.

Cardiovascular and other lesions in calves fed diets low in magnesium, L. A. Moore, E. T. Hallman, and L. B. Sholl. (Mich. Expt. Sta.). (*Arch. Path., 26 (1938), No. 4, pp. 820–838, figs. 7*).—Calves used in previously described experiments (E. S. R., 73, p. 673), which developed a tetany due to magnesium deficiency in the diet, were further investigated for histopathological symptoms. The principal pathological alterations consisted of a deposition of calcium salts in the yellow elastic fibers of the endocardium, of the aorta, jugular vein and larger arteries, of the surfaces of the diaphragm, and of the trabeculae and capsule of the spleen. Degeneration and calcification of the Purkinje fibers were also noted, along with various degrees of inflammation of the liver and kidneys. A possible relationship of low magnesium intake to arteriosclerosis of human beings is suggested.

The sugar and total ketone content of the blood of ewes and of their new-born lambs, L. C. Snook and W. Godden (*Biochem. Jour., 32 (1938), No. 11, pp. 2037–2039*).—In a study at the Rowett Research Institute, blood samples from normal and ketonemic ewes prior to and shortly after lambing and from newborn lambs were analyzed for sugar and total ketones. A marked rise in blood sugar level at parturition was noted in both normal and hypoglycemic ewes, with some evidence that post partum there is a fairly rapid return to

the normal level. Hypoglycemia in the pregnant ewes was reflected in a much lower blood sugar level at paturition and lower blood sugar in the newborn lambs than for normal ewes. The blood of the newborn lamb contained a higher sugar level than that of its dam bled at the same time. Newborn lambs from ketonemic ewes showed complete freedom from ketone bodies in their blood.

The influence of cobalt on pine disease in sheep, H. H. Corner and A. M. Smith (*Biochem. Jour., 32 (1938), No. 10, pp. 1800–1805*).—The Edinburgh and East of Scotland College of Agriculture secured evidence that the pine disease of sheep, which is prevalent in the Cheviot region of Scotland, is a nutritional anemia which is not due to a deficiency of iron, copper, or manganese and which can be cured or prevented by the administration of cobalt salts. The administration of 1 mg. of cobalt per head daily for 14 days proved sufficient to prevent the disease for 6 mo. when sheep were confined to land commonly producing this disorder. A similar dosage was also effective as a cure.

[The progress of swine improvement in Canada] (*Sci. Agr., 19 (1938), No. 3, pp. 138–176, pl. 1 figs. 2*).—The following listed papers were presented before a symposium held in Ottawa in June 1938 at the annual meeting of the eastern section of the Canadian Society of Animal Production: Advanced Registry For Pure Bred Swine, by A. W. Peterson (pp. 139–142); Test Station Operation, by R. G. Knox (pp. 143–146); Results of Station Testing in Canada, by J. G. Lefebvre (pp. 147–154); The Analysis and Interpretation of Hog Carcass Data, by E. W. Crampton (pp. 155–161); A Study of Factors Influencing Swine Carcass Measurements, by J. G. Stothart (pp. 162–172); and The Market Value of Canadian Bacon, by L. W. Pearsall (pp. 173–176).

Fish meal for bacon hogs, S. A. Hilton (*Sci. Agr., 19 (1938), No. 3, pp. 121–137*).—This report from the Dominion Experimental Farm, Nappan, N. S., briefly summarizes the results of a series of feeding trials comparing whitefish meal with skim milk, tankage, and other supplements as a source of protein for bacon hogs. On the basis of average daily gains, feed required per unit of gain, and carcass grade, the fish meal compared very favorably with the other supplements tested. A bibliography of 152 references is appended.

Transit shrinkage of fasting pigs (*[Gt. Brit.] Bacon Devlpmt. Bd. Bul. 3 (1938), pp. 36, figs. 2*).—The transit shrinkage of groups of pigs shipped by rail from distances ranging from 38 to 300 miles and lasting from 1½ to 42 hr. was studied. The decrease in carcass weight of fasting pigs during transit was found to progress at a rather constant rate, averaging approximately 3 lb. per head per 24-hr. period. This loss was greater in the trimmed sides than in the head, backbone, feet, and other bony parts of the carcass, indicating that the tissue wastage occurred mainly in the muscular and/or fatty tissues, probably due to abnormal water losses from such tissues. The duration of transit did not appreciably affect the conformation or quality of the carcass, its suitability for tank curing, or the net yield of tank bacon per 100 lb. of carcass weight. There was a tendency for an increase in thickness of the flank with increasing length of the transit period. Pigs moved by fast carrier lost less than pigs fasted for the same period and moved over the same distance by slower train.

25 years' stallion enrollment in Indiana (*Indiana Sta. Circ. 240 (1938), pp. 52, figs. 14*).—A brief résumé of the activities of the Indiana stallion enrollment board over the past 25 yr. is presented, along with a directory of enrollments and renewals issued from January 1 to December 31, 1938, classified by counties (E. S. R., 79, p. 378).

The meat requirements of fox vixens during the reproductive period, C. F. BASSETT. (U. S. D. A.). (*Amer. Fur Breeder, 11 (1939), No. 8, p. 10*).—A comparison of the reproduction records of groups of vixens maintained on rations containing 40 and 60 percent of raw meat, respectively, indicated that the former is fully as desirable as the latter.

Breeding for poultry viability, D. R. MARBLE (*Pennsylvania Sta. Bul. 377 (1939), pp. [2]+38, figs. 8*).—A 5-yr. program of selection of breeders from the most viable families of Single Comb White Leghorns and Barred Plymouth Rocks has resulted in improved viability in the rearing flock and a 50-percent reduction in mortality in the laying flock, with only a slight decrease in chick viability. Greater viability of adult birds was obtained among birds hatched from eggs produced by hen breeders than from those by pullet breeders. Definite family differences were established in the extent to which resistance to the fowl paralysis complex developed. Subsequent laying flock mortality of 5-month-old pullets showing gray-eye condition was considerably greater than for pullets possessing normal eyes. Laying flock mortality was distributed rather uniformly over the laying year. Increased viability was obtained without significant losses in egg production, egg size, age at sexual maturity, and body weight.

Influence of fattening foodstuffs and temperature on the fowl's body fat [trans. title], T. TAKITA (*Bul. Sci. Fakult. Terkult., Kjuŝu Imp. Univ., Fukuoka, Japan., 8 (1938), No. 1, pp. 1–15; Eng. abs., pp. 14, 15*).—When one-half of the ration of fattening fowls was variously supplemented by ground Italian millet, ground corn, ground great millet, soybean hulls, wheat flour mixed feeds, and ground buckwheat over a 30-day fattening period, no significant differences were found in the physical or chemical characters of the body fat as a result of the ration. A comparison of fowls fattened in winter (average temperature 5° C.) and in summer (average temperature 27°) indicated that the body fat of the former contained only about one-fourth as much free fatty acid but more liquid fatty acid than that of the latter. Reichert-Meissl, Polenske, iodine, and thiocyanogen values were all materially higher at the winter temperature. From these facts it is inferred that animals placed in a disadvantageous environment require relatively unstable compounds for their preservation.

Fluctuations of phosphatase and inorganic phosphorus in the blood of the laying hen during the period of egg formation, W. J. PETERSON and D. B. PARRISH. (Kans. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 1, pp. 54–58*).—Blood samples from hens which had been laying for 9 mo. and from pullets which had just come into lay, collected immediately after and at approximately 12 and 26 hr. after oviposition of the previous egg, were analyzed for phosphatase and inorganic phosphorus. In the former group the average plasma phosphatase was 30 percent higher and the inorganic plasma phosphorus 15 percent higher at the time of active shell deposition than at the start of the 26-hr. egg cycle. In the latter group there was an increase of 35 percent in phosphatase and 39 percent in inorganic phosphorus at the period of active shell deposition. The possible role of phosphatase in eggshell formation was discussed.

Phosphatase and inorganic phosphorus in the plasma and whole blood of the fowl, W. J. PETERSON and D. B. PARRISH. (Kans. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 1, pp. 59–62*).—The average plasma phosphatase values of 5-month-old cockerels and pullets were found to be 20 and 22.9 units, respectively, while corresponding values in the whole blood were 16.5 and 17.2 units. For birds of corresponding breed and sex at 16 weeks of age the plasma contained 8.8 and 9.7 units and the whole blood 7.8 and 10.4 units, respectively.

There was no significant difference in the inorganic phosphorus content of the plasma and whole blood in either sex.

The effect of resecting the so-called "chalaziferous region" of the hen's oviduct on the formation of subsequent eggs, B. R. BURMESTER and L. E. CARD. (Univ. Ill.). (*Poultry Sci., 18 (1939), No. 2, pp. 138–145, fig. 1*).—In an effort to obtain additional information on the mechanism of chalaza formation in eggs, 31 hens were surgically altered by the removal of sections of the oviduct from 2 to 7 cm. long from the chalaziferous region of the infundibulum. Of the 25 hens surviving the operation, 12 laid normal eggs, and dwarf or yolkless eggs were laid by 19. Some laid nothing but yolkless eggs, others laid dwarf eggs alternately with normal eggs, and 7 laid one or more yolkless eggs when first coming into production and only normal eggs thereafter. With 9 hens laying a sufficient number of normal eggs after the operation to allow a comparison of pre- and postoperative eggs, there was no significant change in the weight of the chalaza, total egg weight, or proportions of the egg white layers, even though the percentage of the chalaziferous region removed ranged from 44 to 88. A normal-appearing chalaza in the inner thin white surrounded by a thick firm white layer was found in most of the dwarf eggs. The correlation between the weight of the chalaza and that of the inner thin white was lower in the yolkless eggs than in the normal ones.

A comparison of dry milk, meat and bone meal, and combinations of both as protein supplements for egg production and a critique of methods, E. W. HENDERSON. (Iowa Expt. Sta.). (*Poultry Sci., 18 (1939), No. 2, pp. 106–113*).—Employing the all-mash method of feeding, the influence of eight different protein supplements on the egg production of White Leghorn pullets and hens was measured by three different statistical procedures. The various supplements included dried milk at 15, 10, and 5 percent levels, meat-and-bone meal at 10 and 5 percent levels, and combinations of dried milk and meat-and-bone meal at 5 and 5, 9 and 5, and 5 and 8 percent levels. An analysis of variance of the average annual egg production (October 1 to September 30) of pullets failed to show any significant differences between the various pens. However, when the October production records were omitted and the production records for the remaining 11 mo. were similarly analyzed, significant differences appeared. When yearling hens were distributed among the pens with respect to the previous year's production, highly significant differences were obtained by the three methods of calculation. The average egg production (11 mo.) was 152, 139, and 121 eggs, and the percentage production per hen days was 45, 42, and 37 for the milk, the combination, and the meat-and-bone meal groups, respectively.

The effect of certain mineral salts on the amount and severity of perosis, R. M. SHERWOOD. (Tex. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 2, pp. 165–167*).—In a comparison of the effect of eight experimental rations on the incidence of perosis in chicks, it was found that the basal diet containing 9 p. p. m. of manganese, 420 p. p. m. of aluminum, 98 p. p. m. of iron, 1.41 percent of calcium, and 0.72 percent of phosphorus gave very poor protection against this disorder. Increasing the aluminum and iron content of the diet only slightly improved the degree of protection. Substituting 20 percent of wheat gray shorts for an equal amount of milo in the diet increased the total manganese to 21 p. p. m. and afforded almost complete protection, as did the addition of 37 p. p. m. of manganese to the basal diet. Adding the ash of 20 percent of wheat gray shorts to the diet was less effective than when this amount of shorts was incorporated in the diet.

The amount of manganese required to prevent perosis in the chick, W. D. Gallup and L. C. Norris. (Cornell Univ.). (*Poultry Sci., 18 (1939), No. 1, pp. 76–82*).—When New Hampshire chicks were reared on a low manganese basal diet, perosis developed in approximately 80 percent of the cases. When the manganese content of the diet was increased to 50 p. p. m. by additions of chemically pure $MnCl_2$, $MnSO_4$, $KMnO_4$, $MnCO_3$, and MnO_2, the incidence of perosis was reduced to about 4 percent, with evidence that these various salts were equally effective. In trials to determine the minimum amount of manganese required to prevent perosis, graded levels of manganese intake from 20 to 100 p. p. m. were provided by additions of $MnCO_3$. A level of 30 p. p. m. completely prevented perosis in White Leghorns, while 50 p. p. m. reduced perosis to 7 percent in a normal strain of New Hampshires and to 18 percent in a highly susceptible strain of New Hampshires, thus indicating breed differences. A diet containing 1,000 p. p. m. of manganese was fed over a period of 20 weeks with no toxic effect.

The effect of a deficiency of manganese in the diet of the hen, W. D. Gallup and L. C. Norris. (Cornell Univ.). (*Poultry Sci., 18 (1939), No. 1, pp. 83–88*).—Groups of New Hampshire pullets were fed rations containing 13, 53, 200, 500, and 1,000 p. p. m. of manganese, respectively. As the manganese intake increased over this range the manganese content of the eggs progressively increased from 0.045 to 0.342 mg. per 100 gm. of dry yolk. The lower level of manganese intake resulted in low egg production and high mortality of embryos, with such deaths generally occurring late in the incubation period. Production was slightly lower, but hatchability was as good at the 53 p. p. m. level of intake as at the higher levels. The minimum manganese requirement of the developing embryo was found to be about 0.005 mg., which represented approximately 70 percent of the manganese in the egg. Chicks hatched from low-manganese eggs and having a low initial manganese reserve were no more susceptible to perosis than those hatched from high-manganese eggs.

Beryllium rickets in chickens, H. D. Branion, F. F. Tisdall, and T. G. H. Drake (*Poultry Sci., 18 (1939), No. 1, pp. 66–69, figs. 4*).—In tests by the Ontario Agricultural College et al., the growth and bone development of chicks receiving a normal ration and others receiving a similar diet supplemented with 0.5, 1, and 2 percent beryllium carbonate were compared. The chicks tolerated 0.5 percent over the 10-week experimental period with no evidence of rickets or abnormal bone development, but those receiving the 1 and 2 percent levels developed beryllium rickets as evidenced by low levels of inorganic plasma phosphorus, subnormal percentages of ash in the leg bones, and poor bone calcification. Individual birds varied somewhat in their response to the higher levels, but, in general, chickens are deemed more resistant to beryllium rickets than are rats.

Cereals and rickets.—IX, The availability of phytin-P to the chick, J. T. Lowe, H. Steenbock, and C. H. Krieger. (Wis. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 1, pp. 40–44*).—Continuing this series of studies (E. S. R., 78, p. 577), chicks were fed a low-calcium, low-phosphorus basal diet variously supplemented with calcium carbonate, disodium phosphate, phytin, and cod-liver oil, involving 15 combinations in all. The addition of phytin in sufficient quantities to increase the phosphorus content of the basal diet 50 percent did not improve the calcification of the bones of chicks, while addition of an equivalent amount of phosphorus as disodium phosphate raised the bone ash approximately 10 percent. Additions of calcium carbonate or cod-liver oil did not significantly influence the utilization of phytin phosphorus. The point is stressed that cal-

cium: phosphorus ratios may be poor criteria of the proper mineral balance of a ration, since total phosphorus needs bear no relation to available phosphorus.

The effect of chondroitin sulfuric acid on gizzard erosion and growth in chicks, L. A. Crandall, Jr., F. F. Chesley, R. E. Gray, and H. E. Robinson (*Jour. Nutr., 17 (1939), No. 1, pp. 53–61*).—A series of tests was conducted with chicks to determine the growth-promoting and gizzard-erosion-preventing activity of both commercial and purified chondroitin sulfuric acid when added at 3-percent levels to a commercial chick mash and to three different types of basal diets used by other investigators to experimentally produce gizzard erosions. No evidence was obtained to indicate that either preparation exerted any specific protective action against gizzard erosions. Under certain conditions they did exert a favorable effect on growth, leading to the suggestion that any slight influence upon gizzard erosion might be the result of a general nutritional improvement rather than the action of a specifically protective substance.

The production of goiter in chickens, A. R. Patton, H. S. Wilgus, Jr., and G. S. Harshfield. (Colo. Expt. Sta.). (*Science, 89 (1939), No. 2303, p. 162*).—The production of experimental goiter in chicks by feeding a ration containing 0.145 mg. of iodine per kilo and the prevention of goiter by the addition of 5 mg. of iodine per kilo to the same ration are reported. Thyroid weights of chicks fed the basal diet were 130, 240, and 294 percent of those of the control group at 6, 12, and 18 weeks of age, respectively. The histopathological conditions of the enlarged thyroids are described.

The determination of vitamin A in the hen's egg, C. A. Baumann, J. Semb, C. E. Holmes, and J. G. Halpin. (Wis. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 1, pp. 48–53*).—Vitamin A was determined in eggs from White Leghorns which had received varying amounts of sardine or cod-liver oils as supplements to a standard poultry ration for 7 mo. Spectrophotometric determinations on egg yolks indicated a range from 5.4 μg. of vitamin A per gram for those birds on a sardine-oil diet to 9.2 μg. for those birds on a diet containing 2 percent cod-liver oil. Eggs from birds receiving 1 percent sardine oil and 0.5 and 2 percent cod-liver oil were incubated, and the newly hatched chicks were assayed colorimetrically or placed on a low vitamin A diet and allowed to succumb to the effect of the deficiency. The vitamin A content of the chicks, as well as the period of their survival, varied with the amount of vitamin A in the yolk, satisfactory agreement being obtained for the 3 technics. Four μg. of vitamin A in the yolk extended the life of the chick for 1 day.

Breed differences in resistance to a deficiency of vitamin B_1 in the fowl, W. F. Lamoreux and F. B. Hutt. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 4, pp. 307–316, figs. 2*).—In each of four experiments comparing chicks of the White Leghorn and Rhode Island Red breeds, the former showed a greater ability to survive on diets deficient or lacking in vitamin B_1 than the latter. Chicks of the White Leghorn and Rhode Island Red breeds survived an average of 12.9 and 10.8 days, respectively, when fed the deficient basal diet from hatching, 22.1 and 16.9 days when similarly treated except that they received an adequate diet on the third day only, and 34.1 and 29 days, respectively, when fed a normal diet to 2 weeks of age and the deficient diet thereafter. When chicks were fed a normal diet to 3 weeks of age and a deficient diet thereafter the percentages of chicks surviving to 13 weeks of age were 32, 20.5, and 8 for the White Leghorns, Rhode Island Reds, and Barred Plymouth Rocks, respectively. The superior resistance of the Leghorns to this deficiency was shown to be independent of body size and was not caused by differential mortality from other causes than polyneuritis. F_1 progeny of a Leg-

horn male × Rhode Island Red females were intermediate between the parent strains in resistance to this vitamin deficiency.

The effect of the level of protein intake on the growth and feed utilization of turkeys, J. C. HAMMOND and S. J. MARSDEN. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 1, pp. 11–18, figs. 7*).—Seven lots of Bronze turkeys, totaling 1,379 individuals, were reared to 28 weeks of age on poor grass range with ad libitum feeding of both mash and grain. The mash rations varied in protein content from about 18 to 30 percent by 2-percent increments. Mortality, malformation of legs or breastbones, and quantity of feed required per unit of gain were not significantly affected by either the protein content or calcium and phosphorus contents of the mash. During the first 16 weeks the average live weight of the lots was approximately in the same order as the quantity of protein fed. Birds fed the 28-percent mash weighed the most at all ages after 12 weeks, attaining an average weight of 15 lb. in 164 days, while birds receiving the 18-percent mash weighed the least at all ages and reached a 15-lb. average in 188 days. Under ad libitum feeding the birds ate more grain and less mash as the protein content of the mash increased, although the protein intake was not stabilized until the protein content of the mash reached 26 to 30 percent. The birds receiving the 18-percent mash were the most efficient on the basis of total protein and of animal protein required per pound of gain. Between 21 and 28 weeks of age the protein consumption of all groups was approximately the same, averaging about 16 percent.

Artificial incubation of some upland game birds' eggs, A. L. ROMANOFF, G. BUMP, and E. HOLM (*N. Y. State Conserv. Dept. and Col. Agr. Bul. 2 (1938), pp. 44, figs. 9*).—These studies were conducted to determine the optimum environmental conditions applicable to the practical incubation of pheasant, grouse, and quail eggs and to establish recognizable symptoms by which the cause of unsuccessful hatches might be determined. When the agitated-air-type incubator with separate hatcher was used, an incubation temperature of 99.5° F. and a relative humidity of from 63 to 68 for pheasants and from 60 to 65 for grouse and quail during the first 20 days of incubation proved most satisfactory. After the twentieth day a slight decrease for both in the case of quail eggs proved desirable. Higher incubation temperatures were required in the still-air-type than in the agitated-air-type machines. Turning eggs from 3 to 4 times a day and incubating them in a horizontal position are recommended. Other practical suggestions are outlined.

DAIRY FARMING—DAIRYING

Proceedings [of the] twenty-fourth annual meeting, western division, American Dairy Science Association (*Amer. Dairy Sci. Assoc., West. Div., Proc. Ann. Mtg., 24 (1938), pp. [3]+92, figs. 6*).—The following listed papers are published in full in the proceedings of the meetings held at Portland, Oreg., October 2, 1938 (E. S. R., 79, p. 96): Some Experiences With Idaho Cooperative Bull Associations, by D. L. Fourt and I. H. Loughary (pp. 17–22) (Univ. Idaho); The Fertilization of Irrigated Pastures, by I. R. Jones, H. P. Ewalt, and J. R. Haag (pp. 30–34) (Oreg. State Col.); The Dry Matter Consumption of Holstein Cows on Roughage Rations, by J. C. Knott and R. E. Hodgson (pp. 35–38) (Wash. State Col.); A Comparison of Nutrient Requirements With Nutrient Consumption by Cows on All Roughage Rations, by R. E. Hodgson and J. C. Knott (pp. 39–43) (U. S. D. A., Wash. State Col., and West. Wash. Expt. Sta.); Variations in Reproductive Efficiency of Dairy Cattle, by A. Spielman and I. R. Jones (pp. 44–49) (Oreg. State Col.); Acid Values and

Acid Ratios as Related to the Keeping Quality of Salted Butter, by H. A. Bendixen (pp. 50–60) (Wash. State Col.); The Magnitude of the Volume Change Accompanying Water Sorption in Dry Milk Solids, by E. L. Jack (pp. 61–67) (Univ. Calif.); A Study of the Seasonal Changes in the Properties of Milk Fat From an Alfalfa Feeding Area of Eastern Oregon, by R. E. Stout and R. W. Stein (pp. 68–75) (Oreg. State Col.); and The Influence of Lighting Conditions on the Accuracy of the Babcock Milk Test, by D. R. Theophilus and D. C. Barnett (pp. 76–79) (Univ. Idaho).

[Experiments with dairy cattle and dairy products in California] (*California Sta. [Bien.] Rpt. 1937–38, pp. 98–100*).—Findings are briefly described on the effect of heat on dairy cows, methods of preventing off-flavors in milk, and improved methods for the manufacture of casein.

[Experiments with dairy cattle and dairy products in South Dakota], T. M. Olson (*South Dakota Sta. Rpt. 1938, pp. 26–30*).—Records of dairy cattle investigations include the comparative returns from sweetclover, alfalfa, Sudan grass, and permanent pasture mixtures, the effect of direct sunlight on the growth, reproduction, and production of dairy cattle, the influence of fineness of grinding grains on the coefficients of digestion on dairy cows, the effect of vitamin D deficiency on mature dairy cows, the influence of roughages on the vitamin D potency of milk, and the relative efficiency of dairy breeds in transferring and converting vitamin D in the feed to milk.

Studies with dairy products include the relationship between the lipolytic and proteolytic micro-organisms in butter and the development of specific flavor defects, and the bacterial content and keeping quality of butter after removal from cold storage.

[Investigations with dairy cattle and dairy products in Washington]. (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 368 (1938), pp. 30–36*).—Progress reports of dairy cattle studies (E. S. R., 79, p. 382), by R. E. Hodgson, J. C. Knott, H. K. Murer, R. R. Graves, E. L. Overholser, and K. Baur, include the nutritive value of home-grown hay and silage rations and of alfalfa hay rations for milking cows, a comparison of roughages alone v. roughages and limited amounts of concentrates for dairy cattle, methods of measuring pasture returns, the effect of type of construction on the losses and nutritive value of stack silage, the effect of apples in the ration on milk production, and the proving of dairy sires.

Reports of dairy products studies, by H. A. Bendixen, C. C. Prouty, E. V. Ellington, N. S. Golding, E. C. McCulloch, Murer, and G. H. Farrah, include the correlation of cream quality with butter quality; the manufacture, ripening, and development of foreign varieties of cheese; the gas requirements of certain strains of *Penicillium roqueforti;* bacterial development in milk from udder quarters infected with mastitis; and chemical factors affecting the quality of dried milk solids for baking purposes.

Live weight and milk-energy yield in the Wisconsin dairy cow competition, W. L. Gaines. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 1, pp. 49–53, figs. 2*).—A report by Brody and Cunningham (E. S. R., 75, p. 831) indicated that the gross efficiency of milk production in cows is independent of live weight. In a further analysis of the same data the author has shown that the milk-energy yield per unit of live weight is also independent of live weight. From the above findings it has been deducted that the feed energy required for working maintenance is proportional to live weight. The point is stressed that in considering the genetics of milk yield in dairy cows a distinction should be made between the size of the animal which may be measured by live weight

and proclivity to lactation which may be measured by milk-energy yield per unit of live weight.

The level of inorganic phosphorus in the blood of dairy cattle, S. R. Johnson. (Pa. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 1, pp. 15–21*).—Data are presented on the inorganic phosphorus content of the whole blood of over 200 cattle, mostly cows and heifers, in normal health and nutrition. Values for immature cattle decreased with advancing age in an approximately regular manner, averaging from 6.42 mg. per 100 ml. for calves under 7 mo. to 4.7 mg. for calves from 25 to 30 mo. of age. There was relatively little difference in the values for milking cows at younger ages, but aged cows showed significantly lower values than middle-aged ones. No influences of breed or type of roughage fed on the blood phosphorus values were observed, and the effect of the level of milk production was questionable. Average values for milking cows, dry cows, and all cows were 4.28, 4.35, and 4.29 mg., respectively.

Calcium, phosphorus, and magnesium requirements in the nutrition of lactating cows, C. W. Holdaway. (Va. Expt. Sta.) (*Va. Acad. Sci. Proc., 1938, p. 63*).—Mineral balance trials with milking cows indicated that as the alfalfa hay intake was increased to provide large excesses of calcium there was a progressive increase in the calcium in the excreta above the increased amounts fed until a point was reached where the calcium in the excreta exceeded the amount ingested. Widening the calcium: phosphorus ratio by feeding excessive amounts of calcium did not affect the utilization of phosphorus. Monosodium phosphate as a supplement caused marked elimination of phosphorus in the excreta so that no phosphorus was retained for maintenance or productive purposes.

Observations on specific nutritional factors in lactation, S. J. Folley, E. W. Ikin, S. K. Kon, and H. M. S. Watson (*Biochem. Jour., 32 (1938), No. 11, pp. 1988–1999, fig. 1*).—In the first experiment described, female rats were fed a basal ration of ground rice, purified casein, butter, salt mixture, and yeast, either alone or supplemented with fresh liver, liver extract, or additional yeast, through gestation and lactation periods. Most of the rats on the basal diet nursed and weaned a high percentage of their young, and the performance of the rats on the supplemented diets was in no way superior to the ones on the basal ration. In a second trial, whitefish muscle meal replaced the casein in the basal diet. A high percentage of the rats on this diet nursed their young normally with good resulting growth. Stock colony rats which failed to rear their first litters proved more likely to lose their second litters than those which had successfully reared their first litters. The subcutaneous implantation of pig pituitary tissue into such rats after the second parturition had no influence on their ability to raise their young. No evidence was obtained to indicate the existence of specific dietary factors stimulating lactation which are qualitatively different from those normally required by nonlactating individuals.

The site of fat synthesis in the mammary gland, P. L. Kelly and W. E. Petersen. (Minn. and Ark. Expt. Stas.). (*Jour. Dairy Sci., 22 (1939). No. 1, pp. 7–16, figs. 5*).—The results of three lines of investigation are summarized. Attempts to trace the course of milk fat synthesis by giving the cows feed heavily stained with Sudan IV gave entirely negative results. In all cases the fat in the alveolus was unstained. Biochemical analyses of 10 mammary glands from cows in various stages of lactation indicated the presence of quite large quantities of free fatty acid in the actively secreting glands, while resting glands contained much smaller amounts and glands undeveloped by pregnancy contained only a trace of free fatty acid. Histochemical studies with various

stains to differentiate between free fatty acid and neutral fat indicated the presence of free fatty acid in the secretory cells of the mammary gland, particularly in their basal portion, while neutral fats were concentrated near the distal portions of the alveolus. The free fatty acids did not occur as particles but apparently were present in the molecular or colloidal state.

Studies in the secretion of milk fat, I, II (*Biochem. Jour., 32 (1938), No. 10 pp. 1856–1876, figs. 6*).—Two parts of this investigation are noted.

I. *The effect of inanition on the blood lipoids of the lactating cow*, J. A. B. Smith.—Using the same experimental cows previously described (E. S. R., 81, p. 100), it was found that over a 12-day fasting period only slight decreases occurred in the lipoid levels in the corpuscles, whereas reductions of from 40 to 50 percent occurred in the lipoid content of the plasma, and this low level persisted even 6 weeks after liberal feeding was resumed. No appreciable change was noted in the nature of the lipoids in either the corpuscles or plasma as a result of fasting. Only fractional amounts, if any, of water-soluble fatty acids were present in the nonphosphatide fraction of the plasma of lactating cows.

II. *The effect of inanition on the yield and composition of milk fat*, J. A. B. Smith and N. N. Dastur.—As previously noted, the fat content of the milk increased sharply, but a steady decline in total fat secretion occurred, with advance of the fasting period. A marked change in the composition of the butterfat was noted, characterized by oleic acid largely replacing the lower acids up to and including C_{14}. The probable significance of this phenomenon is discussed. A modified procedure for the analysis of butterfat by fractional distillation is described.

Carotene balance and blood-carotene levels in heifers and lactating dairy cows, and their relation to the production of off-flavor milk, C. H. Whitnah, W. J. Peterson, F. W. Atkeson, and H. W. Cave. (Kans. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 5, pp. 343–355*).—Spectrographic carotene determinations were made on the rations, blood, and feces of groups of dairy heifers and lactating cows receiving various types of rations to provide carotene intakes ranging from 0.003 to 2.51 mg. per kilogram of body weight. With two groups of heifers on a straw-molasses-cottonseed meal basal ration, one group receiving silage ingested about 5 times as much carotene but excreted only 3.2 times as much as the nonsilage group. The carotene content of the blood and feces of cows was extremely variable, with average blood serum levels ranging from 0.027 to 1.42 mg. per 100 ml., and the percentage of ingested carotene in the feces ranging from 75 to 1,470. The response of cows and heifers to carotene supplement following various feeding regimes suggested that feeding histories for several months may be an important consideration in tests involving carotene metabolism. Low carotene intake was regularly associated with milk susceptible to the development of oxidized flavor, while high carotene levels prevented or remedied this condition. It appeared that the optimum level of carotene intake was many times greater than the minimum required to prevent recognizable deficiency symptoms.

[Dairying experiments in New York] (*New York State Sta. Rpt. 1938, pp. 11, 16, 17*).—Results are briefly noted for the following studies: Methods of improving the quality of certain surface-ripened cheeses, the importance of mastitis in relation to the sanitary production of market milk, effect of plane of nutrition on milk flavor, and the practicability of the phosphatase pasteurization test.

Milk losses in milk plants are an important problem, A. C. Dahlberg (*Farm Res. [New York State Sta.], 5 (1939), No. 2, pp. 9, 10*).—A survey of milk

losses occurring in a number of well-managed milk plants gave evidence that about 0.1 percent of the milk received was lost through incomplete emptying of milk cans, while the total losses averaged 0.5 percent. The possibility of utilizing recovered milk for manufacturing purposes and the relation of unrecovered milk to the sewage disposal problem are presented.

Manual for milk and cream testers in Maryland, C. W. England (*Maryland Sta. Bul. 423 (1938), pp. 121–160, figs. 12*).—This is a revision of parts 1 and 3 and supersedes Bulletin 401 (E. S. R., 77, p. 242).

The calculation of fat corrected milk by means of a nomograph chart, F. B. Headley. (Nev. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 1, pp. 41, 42, fig. 1*).—A nomograph chart, based on the conversion factors of Perkins (E. S. R., 77, p. 534), is presented by which it is possible to determine quickly the 4-percent fat-corrected weight equivalent of lots of milk of any given fat content without mathematical computation.

The status of pasteurization of milk and milk products, M. J. Mack et al. (*Milk Plant Mo., 28 (1939), No. 2, pp. 29–32*).—In this report of the milk and dairy products committee of the American Public Health Association, a résumé of the present status of pasteurization deals particularly with the food value of raw v. pasteurized milk, the effect of pasteurization on certain dietary essentials, the pasteurization of milk products, changing trends in pasteurization equipment and methods, and tests for efficiency of pasteurization. Forty-six references are cited.

Prevention of destruction of vitamin C during pasteurization by carbon dioxide, A. D. Pratt. (Va. Expt. Sta.). (*Va. Acad. Sci. Proc., 1938, p. 64*).—Milk pasteurized in an atmosphere of carbon dioxide was not only a more potent source of vitamin C than milk pasteurized in the presence of air but was also more potent than the raw milk, suggesting that the reversibly oxidized ascorbic acid is converted by the reducing action of carbon dioxide to physiologically active *l*-ascorbic acid.

Effects of high voltage on the bacterial content of milk, I. J. Sandorf (*Nev. Engin. Expt. Sta. Bul. 3 (1938), pp. 14, figs. 9*).—A study of the effect on the bacterial content of milk of applying successive "shots" of high-voltage electricity indicated that the use of high electric gradients of the order of 25,000 v. per centimeter resulted in considerable reduction in average bacterial count.

Irradiation of milk: Factors affecting antirachitic response, H. H. Beck, H. C. Jackson, and K. G. Weckel. (Wis. Expt. Sta.). (*Indus. and Engin. Chem., 30 (1938), No. 6, pp. 632–639, figs. 10*).—The apparatus used in this investigation was arranged so that film area and capacity, radiation intensity, and distance of the radiation source from the film might be controlled and varied. Radiation was provided by a Hanovia quartz mercury-vapor arc. In trials with fresh milk, maximum vitamin D synthesis occurred when the arc was 6 in. distant from the center of a flowing film. All effective radiation was utilized by a film whose width was no more and length no less than twice the perpendicular distance to the arc. The vitamin D potency of irradiated milk had a parabolic relation to the amount of active radiation applied, whereas a hyperbolic relation was found to exist between vitamin D content and film capacity. Variations in vitamin D potency of the milk irradiated in a thin vertical film were only from 50 to 60 percent as great as the responsible combined variations in intensity and film capacity when the variations were expressed as percentage deviations from a mean. The evidence indicated that the data obtained with fresh milk are equally applicable to evaporated milk.

Sanitary problems in connection with the use of the homogenizer, W. J. CORBETT. (Univ. Ill.). (*Milk Dealer, 28 (1939), No. 4, pp. 42, 44, 46*).—A comparison of the bacterial counts of regular and homogenized milks at different seasons of the year showed a consistently higher count in the homogenized samples. Increases in counts due to homogenization were somewhat greater at the beginning than in the middle or at the end of the run. Homogenization of sterile milks indicated some "pick up" of organisms from the homogenizer, but not nearly as much as the increase in count when high-count milk was homogenized. The increase in count was much greater when these types of organisms existing in clumps were present than in the case of those existing singly or in pairs. These increases occurred regardless of whether homogenization took place before or after pasteurization. Normally, bacterial growth occurred much more rapidly in homogenized than in normal milk. However, when each type of milk was sterilized and reinoculated with pure cultures the growth rate was similar in each, suggesting that during homogenization some rapid growing organisms are picked up which multiply very rapidly when milk is stored at temperatures above 50° F.

Determination of carotene and vitamin A in milk, F. R. OLSON, D. M. HEGSTED, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 2, pp. 63–66*).—Results obtained by an extraction method for determining the carotene and vitamin A in whole milk which is fully described were in close agreement with those secured when butterfat was used as the starting material. Comparative assays of fresh, stored, and frozen milks indicated that milk can be stored at low temperature or frozen for considerable periods without affecting its carotene or vitamin A content.

Vitamin A activity of milk fat, L. A. MOORE (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 169–174*).—Monthly milk samples from (1) mixed creamery milk, (2) a Holstein cow receiving pasture in season, and (3) a Holstein cow continuously confined to a ration of alfalfa hay and grain were assayed for vitamin A activity. The samples from sources 1 and 2 showed marked seasonal variation, having the least vitamin A activity in the late spring before pasture was available, increasing very rapidly after the animals were turned on pasture, and reaching greatest potency in the late summer months. The addition of A. I. V. alfalfa silage or A. I. V. oat and pea silage to winter rations more than doubled the vitamin A activity of the milk produced. On the average, 1 qt. of milk per day had sufficient vitamin A activity to meet the minimum vitamin A requirements of an adult person.

The quantitative determination of vitamin C in milk, C. A. KNIGHT, R. A. DUTCHER, and N. B. GUERRANT. (Pa. State Col.). (*Science, 89 (1939), No. 2304, pp. 183–185, fig. 1*).—A method and apparatus for collecting milk samples directly from the cow's udder in a carbon dioxide atmosphere without exposure to light or air are described, also a method of preparing a stable titrating solution of 2,6-dichlorobenzenoneindophenol. Titration of untreated milk samples collected by this method and of samples treated with hydrogen sulfide gave ascorbic values in close agreement, indicating that the ascorbic acid in milk collected in this manner was in the reduced form. No adsorption of ascorbic acid by the milk proteins could be demonstrated.

Ascorbic acid content of milk of various species as influenced by ascorbic acid injection and diet, R. RASMUSSEN, R. BOGART, and L. A. MAYNARD. (Cornell Univ.). (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 3, pp. 502–505, fig. 1*).—The ascorbic acid content of the milk of the ewe, cow, mare, and guinea pig was studied. The ascorbic acid values for ewes' milk, determined at intervals during the lactation period, ranged from 25 to 40 mg. per quart.

With both ewes and cows, intravenous injections of ascorbic acid resulted in a temporary sharp rise in the vitamin C content of the milk. Samples of mares' milk ranged from 27 to 115 mg. of ascorbic acid per quart, with evidence that feed was a factor in the wide variations noted. Milk from guinea pigs receiving a ration of oats and hay with a limited amount of green grass contained about 110 mg. per quart as compared with nearly 400 mg. per quart for guinea pigs receiving green grass ad libitum and 711 mg. per quart for one receiving green grass plus 40 mg. of ascorbic acid daily, thus indicating the marked effect of feed on the ascorbic acid content of the milk from this species.

A study of breed and seasonal variations in the ascorbic acid content of certified milk from Guernseys and Holsteins, A. D. Holmes, F. Tripp, E. A. Woelffer, and G. H. Satterfield. (Univ. N. C. et al.). (*Jour. Nutr., 17 (1939), No. 2, pp. 187–198, fig. 1*).—Samples of raw certified milk collected from Guernsey and Holstein herds at bimonthly intervals for 1 yr. were assayed for ascorbic acid content by the direct titration method. Guernsey samples ranged from 17.76 to 23.37 mg. per liter (average 20.54) and Holstein samples from 15.72 to 20.44 mg. (average 18.17). Considerable seasonal variation was noted for both breeds, the greatest concentration occurring in February while the second slightly lower peak occurred in late fall. No effect of ration or period of lactation on the ascorbic acid content of the milk could be established.

Relation of vitamin C, lecithin, and carotene of milk to the development of oxidized flavor, G. H. Beck, C. H. Whitnah, and W. H. Martin. (Kans. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 1, pp. 17–29, figs. 2*).—Individual samples of milk collected at monthly intervals from cows of the Jersey, Guernsey, Holstein, and Ayrshire breeds were scored for flavor and analyzed for vitamin C, lecithin, and color intensity of the milk fat. Oxidized flavor occurred in 11 percent of all samples studied. The development of oxidized flavor bore no apparent relationship to the vitamin C content of the fresh sample, to the amount of vitamin C lost during 3 days' storage, or to the lecithin content of the milk. There appeared to be a relation between the color intensity of milk fat as produced by the different breeds and the development of oxidized flavor. This color defect was detected in 6.1, 7.8, 15.8, and 19.4 percent of the Jersey, Guernsey, Holstein, and Ayrshire samples, respectively. Moreover, the average color intensity of oxidized samples in each breed group averaged consistently lower than that of nonoxidized samples from this same breed. Feeding relatively small amounts of carotene to cows which had consistently produced milk with oxidized flavor overcame this defect.

Oxidized flavor in milk.—VI, A study of the relation of titratable acidity to metal-developed oxidized flavor in milk, W. C. Brown and R. B. Dustman. (W. Va. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 1, pp. 31–35, fig. 1*).—Continuing this series (E. S. R., 78, p. 243), a study was made of 220 individual cows' samples of milk, in which oxidized flavor was induced by the addition of 1.3 p. p. m. of copper after pasteurization. No relationship was found to exist between the acidity of the freshly drawn samples and the intensity of oxidized flavor development, both normal and oxidized flavored milk occurring in the low acid and high acid milks in approximately the same proportion. Standardization of the acidity of fresh mixed herd milk to 0.13 percent had no effect in preventing the development of oxidized flavor when copper was added after pasteurization. Possible reasons for the variation in these findings and those reported by the [Connecticut] Storrs Experiment Station (E. S. R., 78, p. 390) are discussed.

Distribution of flavors in milk at the receiving platform, G. M. Trout (*Michigan Sta. Quart. Bul., 21 (1938), No. 3, pp. 228–230*).—Flavor studies made

on 920 cans of milk in late summer, representing a large number of producers, showed 44.9 percent of the samples to possess a clean, pleasant flavor. Of the various types of off-flavors found in the remaining samples, feed flavors were most common, making up 43.2 percent of the total, while musty flavors were encountered in 19.9, high acidity in 14.4, and unclean in 11.4 percent, with barny, cowy, oily, or miscellaneous off-flavors making up the balance. Suggestions are offered for overcoming the various types of off-flavors encountered.

Preserving cream with salt (*Natl. Butter and Cheese Jour., 30 (1939), No. 3, pp. 26, 28*).—A method of preserving cream by the addition of salt, for which a public service patent has been granted O. E. Williams of the U. S. Department of Agriculture, is fully described.

The phosphatase test: Its application to sour cream and sour cream butter, E. H. Parfitt and W. H. Brown. (Purdue Univ.). (*Natl. Butter and Cheese Jour., 30 (1939), No. 1, pp. 12–14*).—The authors briefly summarize the available information on the application of the phosphatase test to sour cream and sour cream butter, and present original data to indicate that this test is a good tool to use in controlling the pasteurization of cream for butter making and in detecting butter made from inadequately pasteurized cream but that in the present state of development it should not be considered as a control instrument.

Production of diacetyl from citric acid in butter cultures, E. A. Prill and B. W. Hammer. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 2, pp. 67–77, figs. 8*).—A study of the changes occurring in the diacetyl and acetylmethylcarbinol contents of butter cultures under varying conditions gave evidence that the addition of a small amount of citric acid (about 0.15 percent) to the starter milk, agitation and aeration of the culture, decreasing the pH of the ripened culture by the addition of small amounts of citric acid or even sulfuric acid, and holding the ripened culture at a practical temperature for from 9 to 15 hr., all favored a high diacetyl content in the starter. In general, the same conditions favored a high acetylmethylcarbinol content, although the increase of this component at low temperature was slower than for diacetyl.

Changes in the diacetyl and the acetylmethylcarbinol contents during the manufacture of butter, E. A. Prill and B. W. Hammer. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 2, pp. 79–88*).—The diacetyl and acetylmethylcarbinol contents were determined in creams at various stages of processing and in the butter during various stages of manufacturing. Marked but inconsistent changes in the diacetyl content occurred during the neutralization and pasteurization of sour cream, while changes in the acetylmethylcarbinol content were relatively small. Progressive increases in diacetyl occurred after additions of either regular butter culture, aerated culture, or modified aerated culture to pasteurized cream (either sweet or sour), after holding the mixtures at low temperature overnight, and after partial churning of the mixtures. The content of the acetylmethylcarbinol increased somewhat during the holding period. There was no close relationship between the diacetyl content of the butter culture added to the cream and that of the resulting butter. High diacetyl cultures gave butter of higher diacetyl content than did regular cultures, although not in proportion to the contents in the respective cultures. On the average 8.8 percent of the diacetyl and 4.5 percent of the acetylmethylcarbinol plus diacetyl in the churning mixture were retained in the butter.

Pasteurization of milk for cheesemaking, W. V. Price. (Univ. Wis.). (*Natl. Butter and Cheese Jour., 29 (1938), Nos. 21, pp. 16, 17, 33–37; 22, pp. 20, 21*).—Practical reasons for the widespread adoption of pasteurization of milk for cheesemaking are summarized, with 57 references to the literature.

Milk and starters for brick cheese, W. Langhus, P. R. Elliker, and W. V. Price. (Univ. Wis.). (*Jour. Dairy Sci., 22 (1939), No. 2, pp. 101–106.*)—In a study at 12 Wisconsin factories the cheese milk graded poor in the majority of cases and seldom better than fair, indicating that more careful selection of the milk would result in better cheese. The starters varied greatly in quality and predominating type of organism. It appeared that the cheese was usually no better than the quality of starter used in its manufacture and that improved methods of propagating starters in cheese factories were needed.

Identification of Roquefort cheese, I. D. Garard, A. Minsky, J. H. Baker, and V. Pascale. (Rutgers Univ. et al.). (*Indus. and Engin. Chem., 29 (1937), No. 10, pp. 1167–1171, figs. 2*).—Numerous authentic samples of ewe's milk Roquefort cheese and cow's milk blue cheese were analyzed in the course of this study. Polenske values for fat extracted from the Roquefort cheeses varied from 3.6 to 5.95, whereas values from the cow's milk cheeses did not exceed 2.9 and were usually below 1.8, leading to the conclusion that a Polenske value of less than 3 for blue-mold cheese is conclusive evidence that the cheese is not Roquefort. Fat melted from Roquefort cheese was invariably white or pale yellow with a green tinge, while fat from cow's milk cheese was always yellow in color.

The relation of the quality of milk to the grade of Swiss cheese, L. A. Rogers, R. E. Hardell, and F. Feutz. (U. S. D. A., Ohio State Univ., and Univ. Wis.). (*Jour. Dairy Sci., 22 (1939), No. 1, pp. 43–48, figs. 2*).—Data collected on more than 500 cheeses in 20 factories in Ohio and Wisconsin indicated a close relationship between the quality of cheese milk as measured by the methylene blue reduction test and the quality of the resulting Swiss cheese. When the methylene blue reduction time was under 3 hr. there was only about one chance in three of the cheese grading A or B, while if the reduction time was over 3 hr. two out of three cheeses could be expected to be of A or B grade. When the culturing and manufacturing processes were so adjusted as to give a pH between 6.35 and 6.51 at dipping time, a high percentage of cheeses could be expected to grade A or B, while a pH of over 6.51 greatly reduced the chance of producing high-grading cheese. When the pH at dipping fell below 6.3, it was generally attributable to active thermophilic coccus organisms which developed even during cooking time, and the defective cheese could be attributed directly to the abnormally high acidity.

Effects of the cold storage temperature, heat treatment, and homogenization pressure on the properties of frozen condensed milk, R. W. Bell. (U. S. D. A.). (*Jour. Dairy Sci., 22 (1939), No. 2, pp. 89–100*).—Homogenization pressures ranging from 1,000 to 4,000 lb., pasteurization temperatures ranging from 61° C. for 30 min. to 82° for 15 min., and storage temperatures of from 0° to −17° were employed in these studies. Heating the milk to a temperature sufficiently high to destroy the enzyme hazards prior to other processing steps was essential to prevent the development of rancid flavor. In order to retard oxidized flavor development the milk should be exposed to as severe a heat treatment as possible without impairing its body and flavor. A temperature of 76.5° for 8 min. proved most satisfactory in these trials. Homogenization proved desirable in preventing the formation of an undesirable layer of fat on the surface of the frozen condensed milk and also aided in retarding oxidized flavor development. Pressures of from 2,000 to 3,000 lb. proved most desirable. The unsterilized condensed samples kept better in frozen storage than at 0°, and other conditions being equal the samples stored at −17° were more susceptible to oxidized flavor development than those at −7°. It was shown that under

favorable circumstances market milk could be satisfactorily preserved as homogenized frozen condensed milk for a considerable period.

Preserving the freshness of ice cream through the use of antioxidants, A. D. BURKE and R. M. NEWMAN. (Ala. Polytech. Inst.). (*Ice Cream Rev., 22 (1939), No. 7, pp. 50, 86–88, 90, 92*).—This report essentially confirms previous findings by the Pennsylvania, Massachusetts, and Illinois Experiment Stations (E. S. R., 78, pp. 245, 693; 79, p. 102) on the retardation of oxidized flavor development in ice cream by adding 0.5 percent of oat flour to the ice cream mix. When the normal percentage of gelatin in the mix was slightly reduced this level of oat flour did not impair the body and texture of the ice cream but did impart a slight oat flour flavor.

Protection of ice cream against contamination after pasteurization, F. E. NELSON. (Kans. Expt. Sta.). (*Ice Cream Rev. 22 (1939), No. 7, pp. 46, 69, 70*).—The studies reported indicate that the phosphatase test may be effectively used for detecting the efficiency of pasteurization of ice cream mixes, and that samples negative to the test and showing the presence of the *Escherichia-Aerobacter* group of organisms are indicative of contamination after pasteurization. Various sources of contamination are discussed, and suggestions offered for the care of the ice cream manufacturing and packaging equipment.

VETERINARY MEDICINE

[Report of work in animal parasitology and pathology] (*California Sta. [Bien.] Rpt. 1937–38, pp. 67–77*).—The work of the biennium 1937–38 with diseases and parasites of livestock referred to (E. S. R., 76, p. 848) includes pullorum disease, swell head, and *Hexamita* infection in turkeys, paratyphoid infection of chicks and poults, vaccination for fowl pox, infectious coryza of chickens and other causes of poultry mortality, bovine trichomoniasis, bovine tuberculosis, Bang's disease, mastitis in cows, studies on bovine anaplasmosis, the development of a new and effective hog cholera vaccine, caseous lymphadenitis and enterotoxemia of sheep, stomach worm (*Ostertagia circumcincta*) of sheep, flies (*Lucilia sericata* and *Phormia regina*) that produce myiasis in livestock, and roundworm (*Trichostrongylus axei*) of cattle and sheep.

[Work in animal pathology by the Florida Station] (*Florida Sta. Rpt. 1938, pp. 61, 65, 66, 67, 68*).—The work of the year (E. S. R., 79, p. 534) again relates to investigations by D. A. Sanders of hemorrhagic septicemia in cattle and swine (E. S. R., 80, p. 251) and of enzootic broncho-pneumonia in calves; the etiology of fowl paralysis, leukemia, and allied conditions in animals, by M. W. Emmel (E. S. R., 80, p. 400); and a study of plants poisonous to livestock in Florida, by Sanders, Emmel, and E. West, including *Ambrina ambrosioides* and *Lupinus angustifolius*.

[Work with livestock diseases and parasites by the South Dakota Station] (*South Dakota Sta. Rpt. 1938, pp. 22–26, 37–39, 50*).—The work of the year (E. S. R., 79, p. 535) reported upon includes alkali disease (selenium poisoning), forms of selenium in the soil, sulfur-selenium studies, selenium content of various plants at different stages of growth, selenium as a stimulant to plant growth, distribution of selenium in germinated seeds, toxicity of several forms of organic selenium, and the relationship of arsenic to selenium poisoning, all by O. E. Olson; a study of the properties of the oil of chenopodium obtained by cross-fertilization of *Chenopodium ambrosioides* with a wild variety, as well as the study of the anthelmintic value of the oil obtained from this

cross in the treatment of ascarids, by F. J. LeBlanc and T. R. Wright; and hemorrhagic septicemia, by J. B. Taylor.

[Work in animal pathology by the Washington Station], E. C. McCulloch (*Washington Sta. Bul. 368 (1938), pp. 70–72*).—The work of the year reported upon (E. S. R., 79, p. 391) relates to the development and spread of bovine mastitis, the efficiency of farm disinfectants, lamb dysentery, and hard liver disease of swine.

Report of the veterinary division, 1937, H. V. M. Metivier (*Trinidad and Tobago Dept. Agr. Rpt., 1937, pp. 60–65*).—The work of the year, particularly on disease control and briefly on research operations, is reported.

[Contributions on animal pathology and parasitology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 10 (1938), No. 2, pp. 243–277, 365–441, figs. 38*).—Among the contributions presented are: Variation in the Colony Form of the Anthrax Bacillus, by M. Sterne (pp. 245–250); South African Helminths—II, Some Taenias From Large Wild Carnivores, by R. J. Ortlepp (pp. 253–277) (E. S. R., 80, p. 539); Some Physiological Aspects of the Genus *Tribulus*, by M. Henrici (pp. 367–392); On the Constitution of the Bitter Principle "Geigerin"—I, The Isolation of Various Degradation Acids, by H. L. De Waal (pp. 395–410); The Detection of Strychnine in Carcasses and Corpses, by D. G. Steyn (pp. 411–418); Quantitative Studies Upon Porphyrin Excretion in Bovine Congenital Porphyrinuria (Pink Tooth), I, by C. Rimington, G. C. S. Roets, and P. J. J. Fourie (pp. 421–429); A Further Case of Congenital Porphyrinuria (Pink Tooth) in a Living Grade Friesland Cow in South Africa (Cedara Case), by P. J. J. Fourie and C. R. Rimington (pp. 431–436); and A Rapid Phase Test for Distinguishing Between Carotinoid and Bile Staining of Fat in Carcasses, by C. Rimington and P. J. J. Fourie (pp. 439–441).

A textbook of medical bacteriology, D. L. Belding and A. T. Marston (*New York and London: D. Appleton-Century Co., [1938], pp. XXXVIII+592, pl. 1, figs. 43*).—This concise, yet comprehensive, work, prepared in collaboration with S. B. Hooker, S. C. Dalrymple, J. P. Bill, and M. A. Derow, is presented in several sections, as follows: 1, general bacteriology (pp. 1–124); 2, medical bacteriology (pp. 125–199); 3, pathogenic eubacteriales (pp. 201–289); 4, the pathogenic actinomycetales (higher bacteria) (pp. 291–327); 5, the pathogenic fungi (pp. 329–371); 6, the spirochaetes (pp. 373–397); 7, the viruses, rickettsiae, and bacteriophages, by S. C. Dalrymple (pp. 399–437); 8, immunity, by M. A. Derow and S. B. Hooker (pp. 439–486); and 9, sanitary and economic bacteriology (pp. 487–549). Special methods of staining are dealt with in an appendix (pp. 551–566).

[Contributions on bacteriology and therapeutics] (*Jour. Bact., 36 (1938), No. 6, pp. 665, 666, 668, 669, 670*).—Abstracts from contributions presented are: Some Cultural Characteristics of the Genus *Corynebacterium*, by R. F. Brooks (p. 665) and Cultural Characters of Certain Food-Poisoning Micrococci, by W. C. Haynes (p. 666) (both N. Y. State Expt. Sta.); Allergic Skin Tests for *Brucella* Infection, by D. R. Cordy (p. 668) and *Brucella* Agglutinins in Horses, by W. S. Stone (pp. 668, 669) (both Cornell Univ.); The Bacteriostatic Action of Sulfanilamide Upon Hemolytic Streptococci of Human Origin, by E. Neter (p. 669); and The Effect of Thyroid Activity on the Production of Agglutinins for *Streptococcus pyogenes*, by L. Marshak (pp. 669, 670).

Poisonous plants of the United States, W. C. Muenscher (*New York: MacMillan Co., 1939, pp. XVII+266, figs. 75*).—A manual in which information on the principal plants is brought together in concise form. Part 1 (pp. 1–18) is devoted to the nature and classification of poisonous plants and to plants poisonous or injurious under special conditions. Part 2 (pp. 19–239) presents

concise accounts of specific plants, the arrangement being by families. An 11-page list of references to the literature cited is included.

The alkaloids of Senecio species.—I, The necines and necic acids from S. retrorsus and S. jacobaea. II, Some miscellaneous observations. III, Senecio integerrimus, S. longilobus, S. spartioides, and S. riddellii. IV, Erechtites hieracifolia (L.) Raf., R. H. F. Manske (*Canad. Jour. Res., 5 (1931), No. 6, pp. 651–659; 14 (1936), No. 1, Sect. B, pp. 6–11; 17 (1939), No. 1, Sect. B, pp. 1–9*).—Studies of species of *Senecio* here reported are of importance because the alkaloids found present appear to be rather toxic and produce cumulative effects when ingested by livestock in small doses over extended periods.

Snake bites among domestic animals, R. L. Ditmars (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 383–388, figs. 5*).—Recommendations are made for the treatment of domestic animals, particularly dogs, which are frequently bitten by poisonous snakes. These include "(1) suction by simple, inexpensive, and specifically designed apparatus which is readily available, and (2) neutralization of poison by veterinary antivenin. The administration of antivenin may be intramuscular, or intravenous (the latter in case of rapidly progressive or advanced symptoms) and the amounts of injection should be contingent to the size of the animal (larger amounts for smaller animals) and to the size of the snake and amount of poison injected. The latter point is indicated by the gravity of the symptoms. The combination of both treatments is advisable."

Anaphylaxis as related to biologic prophylaxis and treatment of animals, J. Reichel (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 418–420*).

The mode of action of drugs of the sulphonamide group, J. McIntosh and L. E. H. Whitby (*Lancet [London], 1939, I, No. 8, pp. 431–435*).—The authors find that these drugs do not stimulate leucocytic or phagocytic activity; do not affect the speed of production or the quantity and quality of specific immune bodies; both in vivo and in vitro are not instantly active, and there is a quantitative relationship between the effective dose of the drug and the bacteria affected; are active on highly virulent organisms and those in the logarithmic phase of multiplication; are inactive on rough organisms; and are not germicides. It is considered probable that they act by neutralization of some metabolic function or enzymatic activity.

Sulfanilamide therapy of bacterial infections, R. R. Mellon, P. Gross, and F. B. Cooper (*Springfield, Ill.: Chas. C. Thomas, 1938, pp. XIII+398, figs. 16*).—This work, presented in four sections and an addenda, relates to the therapy of diseases caused by hemolytic streptococci, pneumococci, meningococci, and gonococci. A bibliography of 305 titles is included.

Some diseases of the eyes of lower animals: Methods of examination, diagnosis, and treatment, C. F. Schlotthauer (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 404–408*).

Skin diseases occurring in both man and animals, H. Fox (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 398–403*).

An annotated check list of the parasites of animals in Puerto Rico, H. L. Van Volkenberg (*Puerto Rico Sta. Circ. 22 (1939), pp. 12*).—The parasites of domestic animals in Puerto Rico with their hosts are listed systematically under the headings Arthropoda, Protozoa, Platyhelminthes, Nemathelminthes, and exotic species. A bibliography of these parasites in Puerto Rico containing 49 titles is included.

Ixodes marmotae: A new species of tick from marmots (Acarina: Ixodidae), R. A. Cooley and G. M. Kohls (*Pub. Health Rpts. [U. S.], 53 (1938), No. 49, pp. 2174–2181, figs. 20*).—A description is given of a new species

of tick that is of common occurrence on marmots in northwestern United States under the name of *I. marmotae*. It has been collected in Idaho, Montana, Oregon, Wyoming, and Washington. It is not known to attack man.

The tick problem, J. MacLeod (*Vet. Rec., 50 (1938), No. 39, pp. 1245–1249, 1250, figs. 3*).—A discussion of the control of the British sheep tick *Ixodes ricinus* L.

Longevity of the tick Ornithodoros turicata and of Spirochaeta recurrentis within this tick, E. Francis (*Pub. Health Rpts. [U. S.], 53 (1938), No. 51, pp. 2220–2241, pls. 3, figs. 6*).—The author reports having found that the tick *O. turicata* collected in dry caves in Texas and naturally infected with virulent *S. recurrentis* after 5 yr. of starvation transmitted it to a monkey on which it fed. Ticks which infected a monkey after 4 yr. of starvation infected a second monkey by feeding 2.5 yr. later, thus demonstrating 6.5 yr. of natural infection in ticks.

"Of 119 [*O. turicata* ticks collected in caves in Texas in 1931, 14 are still living at the end of 7 yr., all of which are females. Hereditary transmission of relapsing fever spirochetes was obtained through the eggs from naturally infected ticks and from ticks artificially infected to larvae and first nymphs of the next generation, which by feeding infected mouse, monkey, and man. Transmission was successful when white mice ate bedbugs infected with *S. recurrentis* but failed when mice were bitten by infected bedbugs (*Cimex lectularius*). Spirochetes could not be demonstrated in monkey lice during the first 16 days of subsistence on spirochete-positive relapsing fever monkey blood but were demonstrated daily after the seventeenth day. These infected lice failed to infect a monkey on which 1,550 of them were liberated. Immunity to relapsing fever could not be demonstrated in mouse or monkey 9 mo. to a year after their original infection. Neoarsphenamine failed to show specific therapeutic value in three human cases infected with the Texas strain of relapsing fever."

A list is given of 20 references to the literature.

A filter-passing infectious agent isolated from ticks, I–IV (*Pub. Health Rpts. [U. S.], 53 (1938), No. 52, pp. 2259–2282, fig. 1*).—In the first of the four contributions on a filter passer here presented G. E. Davis and H. R. Cox report upon its isolation from *Dermacentor andersoni*, reactions in animals, and filtration experiments (pp. 2259–2267); in the second R. R. Parker and G. E. Davis report on its transmission by *D. andersoni* (pp. 2267–2270); in the third H. R. Cox gives a description of the organism and cultivation experiments (pp. 2270–2276); and in the fourth R. E. Dyer deals with human infection by it (pp. 2277–2281).

Acquired immunity to ticks, W. Trager (*Jour. Parasitol., 25 (1939), No. 1, pp. 57–81, figs. 8*).—It has been found that a single infestation of guinea pigs or rabbits with larvae of the American dog tick induces an acquired immunity which effectively prevents subsequent batches of larvae from engorging. "In guinea pigs, the immunity develops fully within 2 weeks after the start of the first infestation and lasts at least 3 mo. Guinea pigs first infested with either *D[ermacentor] variabilis* or *D. andersoni* show a cross immunity to larvae of the other species. Similarly, rabbits first infested with either *D. variabilis* or *Haemaphysalis leporis-palustris* show cross immunity to larvae of the other species. Deer mice become relatively resistant to larvae of *D. variabilis* after two or three infestations. The repeated infestation of guinea pigs with nymphs or adults of *D. variabilis* results in a marked reduction in the amount of blood taken by ticks of the later batches. The immunity of guinea pigs to larvae of *D. variabilis* can be produced artificially by the intracutaneous inoculation of an extract of larval ticks. It can be passively transferred by the

intraperitoneal inoculation of serum from guinea pigs hyperimmunized by repeated infestations with nymphs."

A list is given of 35 references to the literature.

A study of hemolytic streptococci with reference to the correlation between their group specific substances and biochemical characteristics, M. C. Hechler and M. A. Farrell (Pa. State Col.). (*Jour. Infect. Diseases, 63 (1938), No. 3, pp. 225–231*).—A study made of the serological and biochemical properties of 42 strains of hemolytic streptococci is reported upon. By means of the precipitin test 37 of the 42 strains were classified into the 7 serological groups of Lancefield. "Five of the 7 serological groups, in a large majority of cases, show a definite relation to the source of the strains. The biochemical and cultural characteristics of all strains within a group are somewhat variable although predominant group reactions are noted. Certain correlations are indicated between the group specific substances and fermentative reactions."

Combined serum and sulphanilamide in the treatment of streptococcal infections in mice, H. Loewenthal (*Lancet [London], 1939, I, No. 4, pp. 197–199*).—The author reports having found that a single dose of sulfanilamide administered at the time of infection with hemolytic streptococci will protect only a minority of normal mice. When administered to mice which have received from 16 to 18 hr. before infection a dose of antiserum incapable by itself of preventing death it protects the majority of them. Mice infected with hemolytic streptococci can be effectively treated with a combination of sulfanilamide and antiserum even if this treatment is begun as long as 18 hr. after infection, when the animals are already severely ill. Since neither sulfanilamide nor antiserum alone can achieve this result it appears that these two therapeutic agents act in a different but complementary manner.

Use of yolk sac of developing chick embryo as medium for growing rickettsiae of Rocky Mountain spotted fever and typhus groups, H. R. Cox (*Pub. Health Rpts. [U. S.], 53 (1938), No. 51, pp. 2241–2247*).—Description is given of a technic whereby the yolk sac of the developing chick embryo is used for the cultivation of rickettsiae. By this method the rickettsiae of Rocky Mountain spotted fever, endemic typhus, European (epidemic) typhus, boutonneuse fever, Brazilian spotted fever, and an unidentified rickettsial disease recently isolated from *Amblyomma maculatum* (ticks) have been readily maintained in serial passage. The yolk sac suspensions of spotted fever and endemic typhus have been as a rule 100 to 1,000 times more infective than mammalian tissues or other tissues of the developing chick and approach the limits reported for tick tissues. In addition, in all the diseases studied, with the possible exception of the *A. maculatum* infection, yolk sac suspensions have produced a more severe infection with a shortened incubation period. Rickettsiae of all the diseases studied, with the exception of European typhus, were readily and consistently found in the yolk sacs.

Further studies on biochemical and serological varieties of Salmonella typhi-murium, P. R. Edwards and D. W. Bruner (Ky. Expt. Sta.). (*Amer. Jour. Hyg., 29 (1939), No. 1, Sect. B, pp. 24–31*).—The authors have found that the behavior of cultures of *S. typhimurium* in the biochemical tests described can be utilized to distinguish epidemiologically related strains. All cultures from a single outbreak of disease are alike in possessing or lacking antigen I of the Kauffmann-White classification. All the cultures included in this study were isolated from pigeons lacking antigen V of the Kauffmann-White schema. It is suggested that the "ammonia weak" strains of Hohn and Hermann constitute a single biochemical type of the IV variant found in pigeons.

A list is given of 22 references to the literature.

Observations on the bionomics of strongyloid larvae in pastures.—I, The duration of infection in pasture herbage, E. L. TAYLOR (*Vet. Rec., 50 (1938), No. 40, pp. 1265–1272, figs. 9*).—Observations on the longevity of strongyloid larvae in grass grown in boxes and kept in the open field are considered. They suggest that considerable benefit may result from resting a pasture even for a few weeks, during which time a considerable reduction in the number of larvae may have occurred.

Specificity of artificial acquired immunity to Strongyloides ratti, A. J. SHELDON (*Amer. Jour. Hyg., 29 (1939), No. 2, Sect. D, pp. 47–50*).—The previous report (E. S. R., 77, p. 851) of artificial immunization of rats against infection with *S. ratti* as a result of serial injections of heat-killed larvae is confirmed. "The specificity of this immunity is established, in that it was not possible to immunize rats against infection with *S. ratti* by means of serial injections of heat-killed larvae of *S. stercoralis*. Although these two forms are closely related and are morphologically and biologically very similar, they appear to be, nevertheless, immunologically different."

Studies on age resistance against trypanosome infections, I–III (*Amer. Jour. Hyg., 29 (1939), No. 1, Sect. C, pp. 13–43, fig. 1*) —Part 1 of this contribution, by M. H. Kolodny, deals with the resistance of rats of different ages to infection with *Trypanosoma cruzi*, with a list of 83 references to the literature (pp. 13–24); part 2, by C. J. Duca, with the resistance of rats of different age groups to *T. lewisi* and the blood response of rats infected with this parasite, with a list of 12 references (pp. 25–32); and part 3, by J. T. Culbertson and W. R. Kessler, with vaccination of rats against *T. lewisi* with special reference to the response of different age groups, with a list of 15 references (pp. 33–43).

Studies of age resistance against trypanosome infections.—IV, The activity of Germanin (Bayer 205) upon Trypanosoma equiperdum infections in rats of different age groups, J. T. CULBERTSON (*Amer. Jour. Hyg., 29 (1939), No. 2, Sect. C. pp. 73–77*).—In continuation of the above studies the author reports having observed a difference in the time required for disappearance of *T. equiperdum* from the blood of infected rats of different age groups after treatment with Germanin.

The serum potassium level in Trypanosoma equiperdum infection in rats: The role of potassium in death from this infection, R. L. ZWEMER and J. T. CULBERTSON (*Amer. Jour. Hyg., 29 (1939), No. 1, Sect. C, pp. 7–12, fig. 1*).—The authors report that the serum potassium level of rats dying of *T. equiperdum* infection is markedly increased, this increase being initiated about 24 hr. before death. It is suggested that this elevated serum potassium is a significant factor in the cause of death of the infected animals.

The effect of splenectomy and blockade on the protective titer of antiserum against Trypanosoma equiperdum, L. R. KUHN (*Jour. Infect. Diseases, 63 (1938), No. 2, pp. 217–224, fig. 1*).—The author has found that the protective titer of sheep anti *T. equiperdum* serum, when injected intraperitoneally in mice, is appreciably reduced provided the mice are splenectomized and blockaded with India ink or normal serum and injected subcutaneously with from 2,500 to 3,000 trypanosomes, but is not reduced if the mice are only splenectomized or if the mice are splenectomized and blockaded with specific (*i. e.*, sheep anti *T. equiperdum*) serum. Furthermore, it is only slightly reduced in mice splenectomized and blockaded with India ink and injected subcutaneously with from 1,200 to 1,600 trypanosomes. Splenectomy plus blockade appears to have no effect upon the resistance of mice to trypanosomes specifically sensitized in vitro. The effect of splenectomy and blockade upon

the protective titer of trypanocidal serum cannot, therefore, be due to inhibited phagocytosis, decreased complement, or reduced opsonin, but it may be due to interference with the concentration of passively acquired antibodies in macrophage tissues.

Progress of tuberculosis eradication in Canada, O. HALL (*Canad. Jour. Compar. Med., 3 (1939), No. 2, pp. 47–50*).

Susceptibility of animals to endemic typhus virus, G. D. BRIGHAM (*Pub. Health Rpts. [U. S.], 53 (1938), No. 47, pp. 2078, 2079*).—In further work (E. S. R., 78, p. 250) the gray squirrel, fox squirrel, cottontail rabbit, swamp rabbit, chipmunk, and skunk were found to be susceptible to the virus of endemic typhus fever. The gray fox was not susceptible.

Chronic ulcerative cecitis in the rat, B. F. JONES and H. L. STEWART (*Pub. Health Rpts. [U. S.], 54 (1939), No. 5, pp. 172–175*).—A brief description is given of a spontaneous disease of rats characterized by chronic ulcerative cecitis and chronic lymphangitis, lymphedema, and lymphoid hyperplasia of the lymph nodes of the mesentery.

The diseases of dairy cattle, S. J. EDWARDS (*Jour. Dairy Res. [London], 9 (1938), No. 3, pp. 356–377*).—This review of progress in the knowledge of mastitis (pp. 356–363), contagious abortion (Bang's disease) (pp. 363–368), and bovine tuberculosis (pp. 368–374), and means for their control, is presented with a list of 137 references to the literature.

Induced cases of traumatic gastritis and pericarditis in dairy cattle, R. W. DOUGHERTY. (Oreg. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 357–362*).—In the studies conducted marked changes were noted "in three cows in which foreign bodies were inserted through the wall of the reticulum so that they extended into the peritoneal cavity. The foreign bodies were carried into the reticulum through rumen fistulae. Hemocytological changes occurred in 4 to 6 hr. after the foreign bodies were inserted. Blood changes included an increase in the total white count, an increase in 'stab' cells, the appearance of myelocytes and juveniles in the blood stream, and a relative decrease in lymphocytes. An increase in sedimentation rate was noted in one animal, in which symptoms of pericarditis were induced by forcing the foreign body through the diaphragm until it touched the heart. This animal showed considerable distress. Rumenal contractions decreased as early as 2 hr. after the foreign bodies were inserted. Animals on which the procedure was repeated showed very few visible symptoms. The blood response, however, was quite marked. A comparison between blood pictures and clinical findings on 30 cases indicated that blood examinations are of great value in prognosing as well as diagnosing traumatic gastritis and traumatic pericarditis."

A bacteriologic study of liver abscesses in cattle, I. E. NEWSOM. (Colo. Expt. Sta.). (*Jour. Infect. Diseases, 63 (1938), No. 3, pp. 232, 233*).—Examinations of a series of 100 abscesses from as many different cattle slaughtered at Denver packing houses are reported upon. The findings have led the author to conclude that most liver abscesses observed in slaughter cattle are due to the invasion of *Actinomyces necrophorus*, although occasionally *Corynebacterium pyogenes* and a white coccus may also be present.

Studies on the variation of the blood cells of cattle in health and during Brucella infections, F. N. BELL and M. R. IRWIN. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Infect. Diseases, 63 (1938), No. 3, pp. 251–262, figs. 6*).—In the experimental work reported, groups of cows which, following an induced infection, "either aborted their fetuses (i. e., susceptible group) or produced living calves at full term (i. e., resistant group), showed the following changes in their peripheral blood cell pictures for the period preceding the infection as con-

trasted with that of the acute stages of the disease: Both resistant and susceptible groups had a significant drop in the average number of leucocytes per cubic millimeter of blood for the period of the counts following the infection. A reduction in mean number was also noted for the red blood cells of each group. Each group of animals, subsequent to infection, showed a definite increase in the average percentage of polymorphonuclear cells. In the resistant group there was a slight, but not significant, rise in the average percentage of monocytes; a very marked increase in the mean proportion of this type of cell was noted in the susceptible animals. Likewise, the reactor individuals possessed a higher percentage of these cells than the normal group, this percentage being practically the same as that of the susceptible individuals during the acute stages of the infection. The average percentage of lymphocytes at all times was in almost direct inverse proportion to that of the polymorphonuclear cells. No significant changes in the average percentages of either basophiles or eosinophiles were noted. The resistant and susceptible groups varied between themselves, in the average percentage of eosinophiles, in the same manner and to the same extent before and during the infection. It was not possible in these studies to eliminate the contribution that other infections than that of *B. abortus* may have made on the variations in the total number or in the proportions of the different types of the cells."

The interrelationships of the blood cells of cattle in health and during Brucella infections, M. R. Irwin and F. N. Bell. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Infect. Diseases, 63 (1938), No. 3, pp. 263–268*).—In studies of normal and *Brucella*-infected cattle made in connection with the work above noted, "the total number of leucocytes was positively, but not always significantly, correlated with the total number of erythrocytes. Only in infected, not at all in normal cattle, was there an appreciable association of the total number of white blood cells with the proportion of any type of these cells, and in such cattle with the percentage of but one type of cell, the monocyte. The proportions of the polymorphonuclear cells, lymphocytes, and eosinophiles were consistently and negatively intercorrelated, but with coefficients of correlation of varying magnitudes between the proportions of these different types of cells. Although in normal cattle the proportion of monocytes was not consistently correlated with that of any other type of leucocyte, in the infected animals it was negatively associated with the percentage of eosinophiles and in the group of susceptible animals with the polymorphonuclear cells. No significant coefficients of correlation were found of the percentage of basophiles with that of any other type of cell."

The relation between the presence of Brucella abortus and agglutinins in milk in cattle showing a blood agglutination titer of 1–200 or higher, D. B. Meyer and I. F. Huddleson. (Mich. Expt. Sta.). (*Cornell Vet., 28 (1938), No. 4, pp. 293–295*).—Report is made of a cultural and serological study of the milk of 1,976 cows in 58 herds, representing 4 breeds and various crossbreds that extended over a period of 6 yr. An average of three milk samples was taken from each cow at intervals varying from 4 to 18 mo., although samples were taken from many cows but once. Of the total number of cows from which samples were taken 35.6 percent had shown a blood agglutination titer of 1:200 or higher. The blood samples were taken at an average interval of 4 mo.

The authors have found that in the majority of the animals studied *B. abortus* appears in the milk before agglutinins are detected therein. It may be present in the udder for a long period without the presence of agglutinins. *B. abortus* and agglutinins may occasionally be present in the udder in the absence of agglutinins in the blood. Approximately 12 percent of animals showing agglutinins in the milk in a titer of 1:100 or higher and positive milk culture become negative to

the former or the latter or to both. These data show that oftentimes there is little, if any, correlation between the presence of *Brucella* in the milk and the presence of agglutinins in the milk.

Resistance to Bang's disease of cattle that have passed through an artificially induced outbreak and recovered, B. A. Beach. (Wis. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 374, 375*).—In studies conducted, approximately 28 percent of 2 herds containing 14 and 7 cows, respectively, that were artificially infected with Bang's disease recovered as shown by the fact that the blood titers returned to normal. "Eighteen of 19 such cows proved resistant to an artificial *Brucella* infection that caused abortions in 36 of 47 controls (76 percent). One cow that had passed through a natural outbreak of Bang's disease and recovered is included in the 18 cows mentioned above. She behaved in exactly the same manner as the others, as far as could be determined."

Methods for the diagnosis and control of bovine mastitis, L. W. Slanetz and J. Naghski (*New Hampshire Sta. Tech. Bul. 72 (1939), pp. 14*).—In an attempt to determine the most practical and reliable tests for the routine diagnosis of mastitis a comparison was made of the value and efficiency of the strip-cup, bromothymol, Hotis, Burri agar slant, blood agar plate, microscopic examination of incubated sample, and Edwards' medium methods. The value of these tests for a mastitis control program and also for the detection of staphylococcic mastitis was considered. It is concluded that the strip-cup, bromothymol blue, and Hotis tests cannot be relied upon for an accurate diagnosis of infection. "The Burri agar slant method was approximately as efficient as the blood agar plate test, but it did not permit any observations on the hemolysis of the organisms, nor was it satisfactory for the isolation of pure cultures. The blood agar plate test when compared to the microscopic test detected 92 percent of the quarters and 97.2 percent of the cows infected with mastitis streptococci. The microscopic test is valuable for the detection of streptococcic mastitis. However, this test offers no information regarding the types of streptococci present and is of little assistance in the diagnosis of staphylococcic mastitis. The leucocyte count is not changed by incubation at 37° C. for 16 to 20 hr. Smears prepared from incubated samples can be used to determine the number of leucocytes per cubic centimeter. A combination of tests is necessary for a complete and accurate diagnosis of mastitis. The examination of milk samples by the blood agar plate method, microscopic test, and Edwards' medium proved very satisfactory for the detection of infected animals. Composite samples can be employed for the detection of mastitis infection. A program which provides for the periodical laboratory examination of samples and segregation with gradual replacement of infected animals appears necessary for the control of bovine mastitis."

A list is given of 34 references to the literature.

Bovine mastitis: Studies on a simplified method of diagnosis, T. L. Jones and F. W. Schofield (*Canad. Jour. Compar. Med., 3 (1939), No. 2, pp. 54–57*).

A method of preparing bovine udders for the study of the pathology of mastitis, O. W. Schalm and C. M. Haring. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 372, 373, figs. 2*).—A description is given of a method whereby the entire bovine udder may be preserved permanently in formalin without material change. "By means of an electrically driven meat-slicer, it can be reduced to serial slices of from 3 to 5 mm. in thickness, making possible a minute examination of all portions of the gland. The method is particularly suitable for use in the collection and long-time preservation of normal and pathological mammary glands for teaching purposes."

Differential staining of sections of unpreserved bovine udder tissue affected with mastitis, W. T. Miller and H. W. Johnson (*U. S. Dept. Agr. Circ. 514 (1939), pp. 4, pl. 1*).—A description is given of a method by which unpreserved sections of bovine udder tissue can be stained to facilitate examination for indications of mastitis lesions. By this method the connective tissue is stained while the normal glandular tissue remains unstained, the presence and extent of the induration in the udders being demonstrated. A cross section of half an udder can be stained in this way without preliminary fixation. The intensity of the staining corresponds to the degree to which the disease has developed.

Pathology of calf pneumonia, W. T. S. Thorp and E. T. Hallman. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 365–371, figs. 16*).—A report is made of 40 cases of calf pneumonia, gross and microscopic examinations of which were made for pathological changes. Of these 26 were studied bacteriologically. "Three variations were noted in the pathology of these cases: (1) An acute pneumonia, which progresses very rapidly, with the animal dying within several days, without evidence of any productive tissue changes but usually with a serofibrinous exudate filling the alveoli, (2) an acute pneumonia superimposed on a chronic bronchiolitis or chronic bronchopneumonia in which a large part of both lungs is consolidated, accompanied by a marked fibrinous pleurisy, and (3) the cases in which large numbers of abscesses and necrotic areas are present in the lung." That the pneumonia was consistently bilateral is considered well established. "It was shown by the gross and microscopic studies that the pneumonia usually begins in the apical lobes and that the pneumonia is consistently of longer duration in the left lung than in the right. Evidence in a large number of cases suggests that accompanying injury to the respiratory bronchioles is prior to a bronchitis of the small and large bronchi. Streptoccocci of the beta type and *Escherichia communior* were considered as probable causative agents in the disease."

Actinobacillosis in sheep, H. Marsh and H. W. Wilkins. (Mont. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 363, 364, figs. 3*).—Report is made of a pyogenic infection of the face met with in Montana in the spring of 1937 in a band of some 2,000 ewes that had been fed hay during the winter. Of these about 60 died as an indirect result of the disease. The authors are led to conclude that the affection encountered is probably identical with that described by M. Christiansen in 1917 [3] and others in Europe as caused by *Bacterium purifaciens*, apparently identical with *Actinobacillus lignieresi.*

Chemical changes in the blood of swine infected with hog cholera, D. F. Eveleth and L. H. Schwarte. (Iowa State Col.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 411–417*).—In the course of a study of experimental cholera in swine, the authors found certain changes in the blood chemistry, particularly in the phosphorus fractions and the total plasma calcium. The details of the work are given in eight tables. A list of 19 references to the literature is included.

The antibody response to swine influenza, C. T. Rosenbusch and R. E. Shope (*Jour. Expt. Med., 69 (1939), No. 4, pp. 499–505, figs. 7*).—It was found that antibodies that neutralize swine influenza virus became detectible in the serum of swine on the sixth or seventh day after infection with swine influenza. "Their appearance corresponded rather closely with clinical recovery. In swine with the milder filtrate disease, neutralizing antibodies did not appear

[3] Maanedsskr. Dyrlaeger, 29 (1917), No. 17, pp. 449–458, fig. 1.

until sometime between the seventh and tenth days. The maximum antibody titers ranged from 1:60 to 1:160 and were attained on from the fourteenth to the twenty-seventh days after infection."

The Moscow 2 strain of equine encephalomyelitic virus as compared with other strains of equine encephalitic viruses, B. F. HOWITT. (Univ. Calif.). (*Jour. Infect. Diseases, 63 (1938), No. 3, pp. 269–286, figs. 5*).—Report is made of a study of one (Moscow 2) of the four groups of equine encephalomyelitis viruses recognized as occurring in and received from the Union of Soviet Socialist Republics. "The eastern and western American and the Moscow 2 varieties of the virus of equine encephalomyelitis show distinct differences in their incubation periods, temperature curves, and in the clinical behavior in guinea pigs. All three strains infect the horse and the same types of experimental animals, although the rabbit is less susceptible for the western form than the guinea pig or the mouse. The eastern American variety may easily infect animals intracutaneously in high dilutions, while the others are less invasive by this route. The Russian form is most infective when given through the central nervous system and does not readily invade by other routes unless in comparatively large doses. Virus may be recovered from the blood serum and the tissues of animals infected with the American strains but not when infected with the Moscow 2, except from the central nervous system and occasionally from the salivary glands. The Moscow 2 strain may survive 7 weeks in the icebox when diluted in water but not if in saline. It also resists heating for 10 min. at 70° C. and can withstand freezing with solid CO_2. The eastern strain can withstand a higher hydrogen-ion concentration than the other two, but all three are destroyed by high acidity. The filtrability and also the viability of all three strains are affected by the type of diluting fluid employed. The Moscow 2 strain has a larger size than the other two, has not so far been cultivated in vitro nor on the chorioallantoic membranes of the developing chick, does not confer immunity on young guinea pigs born of immune parents, and is serologically and immunologically distinct from the American strains as shown by the complement fixation and the neutralization tests and by cross inoculation of immune animals. Brain tissue also contains certain intracytoplasmic inclusions peculiar to this form. The Moscow 2 strain may therefore be considered as a distinct variety of the group of viruses causing equine encephalomyelitis."

Infectious equine encephalomyelitis in Venezuela: Advance data concerning the causative agent, V. KUBES and F. A. RIOS (*Canad. Jour. Compar. Med., 3 (1939), No. 2, pp. 43, 44*).—It is concluded from comparative studies conducted both in vivo and in vitro "that the Venezuelan encephalomyelitic virus is wholly different both from the American western virus and from the Argentine one, with which it has no immunobiological connection; that [it] also differs immunobiologically from the American eastern strain virus with which, however, it has some connection on acount of its high virulence, pathogenicity, etc.; that the immunizing power of the protective vaccine made from autochthonous virus surpasses by far that of the American bivalent vaccine, prepared from both eastern and western viruses; [and] that the Venezuelan encephalomyelitic serum neutralizes the corresponding specific virus, not only in vivo, but also in vitro. Thanks to these studies the causative agent of infectious equine encephalomyelitis has been demonstrated for the first time in Venezuela. It is presumed that the agent in question constitutes a sui generis strain, different from the encephalomyelitis viruses described up to now. The writers are about to finish a complete report on these researches which will be published in due course of time."

Infectious equine encephalomyelitis: Mid-winter case, O. L. OSTEEN. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 441, 442*).—The death of a horse at Ocala in Marion County, Fla., on January 13, 1939 (in which locality mosquitoes may be active in January) from an affection that produced clinical symptoms resembling those of equine encephalomyelitis is reported. The presence of the eastern type of the virus of that disease was revealed by inoculation of guinea pigs and a typing test.

Marsh's disease, A. SAVAGE and J. M. ISA (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 431, 432*).—Under the name Marsh's disease the authors record the appearance in Manitoba during the past 2 yr. of the peculiar disease of horses described by Marsh in 1937 from Montana (E. S. R., 78, p. 108).

Hookworm disease in dogs, J. W. LANDSBERG (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 389–397*).—This contribution is presented with a list of 47 references to the literature.

The immunization of dogs against hookworm, Ancylostoma caninum, by subcutaneous injection of graded doses of living larvae, G. F. OTTO and K. B. KERR (*Amer. Jour. Hyg., 29 (1939), No. 1, Sect. D, pp. 25–45, figs. 4*).—The authors conclude that not only does the phenomenon of actively acquired immunity operate in the host parasite relationship of the canine host and the hookworm *A. caninum*, but it is apparently by far the most important natural means of host control of the infection. They were unable to find any conclusive evidence that the so-called age resistance is an entity in itself.

A comparative study of distemper inclusions, R. G. GREEN and C. A. EVANS. (Univ. Minn. and U. S. D. A.). (*Amer. Jour. Hyg., 29 (1939), No. 2, Sect. B, pp. 73–87, figs. 4*).—The authors have found that canine distemper and epizootic fox encephalitis can be differentiated with certainty by their respective inclusion bodies. The virus of canine distemper produces morphologically identical inclusion bodies in dogs, foxes, minks, and ferrets, but there are minor differences in the distribution of inclusions in the several species. A list of 17 references is included.

A virus disease of cats, principally characterized by aleucocytosis, enteric lesions, and the presence of intranuclear inclusion bodies, W. D. HAMMON and J. F. ENDERS (*Jour. Expt. Med., 69 (1939), No. 3, pp. 327–352, pl. 1*).—A description is given of an acute, highly fatal epizootic disease of cats characterized by fulminating and extreme leucopenia involving all types of "white blood cells, aplasia of the bone marrow, including both the granulocytic and the erythrocytic series and occasionally the megakaryocytes, aplasia of lymphoid tissue, and characteristic intranuclear inclusion bodies in the cells of the intestinal mucosa and in certain cells of the spleen, lymph nodes, and bone marrow. The infection has been induced in healthy cats by means of bacteria-free filtrates of emulsions of the spleen of infected animals. Collateral evidence supports the conclusion that the disease is due to a virus. The pathogenicity of the infectious agent has proved thus far to be strictly limited to the natural host."

Botulism in foxes, N. J. PYLE and R. M. BROWN (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 436–439*).—The poisoning of foxes fed on spoiled fish found to contain *Clostridium botulinum* type A toxin is reported.

Anthrax in farm-raised mink in Oregon, C. R. HOWARTH and L. SEGHETTI. (Oreg. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 433, 434*).—A sporadic outbreak of anthrax in mink in Oregon is reported.

Coccidiosis in muskrats influenced by water levels, J. E. SHILLINGER. (U. S. D. A.). (*Jour. Wildlife Mangt., 2 (1938), No. 4, pp. 233, 234*).—It is pointed out that coccidiosis seldom becomes serious in muskrats in normal con-

ditions, but that in partially dried marshes where the droppings are not washed away heavy infestations take place. "Lesions found in muskrats affected with coccidiosis may be described as grayish-white granular areas in the liver and inflammation in the small intestine. According to the writer's observations, the enteritis may not be as important as the destruction of liver tissue. Although either of these lesions alone, when sufficiently extensive, may cause death, most of the deaths observed seemed more properly ascribed to the coccidiosis of the liver." It is thought that muskrat coccidiosis can be controlled by manipulation of the water level where this is feasible.

Coccidiosis of the chicken, with special reference to species, W. T. JOHNSON (*Oregon Sta. Bul. 358 (1938), pp. 33, figs. 15*).—This bulletin, which has been written by the widow of the late author from rough manuscript notes and tables prepared over a considerable period of research at the station, describes and deals with six species of coccidia infecting the chicken. These are *Eimeria tenella* Raill. and Lucet, *E. maxima* Tyzzer, *E. acervulina* Tyzzer, *E. mitis* Tyzzer, *E. praecox*, and *E. necatrix*, the last two of which are described as new. The contribution, with a list of 21 references to the literature cited, is summarized as follows: "The average measurements in microns of 50 sporulated oocysts for each species were 13.7 by 15.0 *E. mitis*, 13.8 by 18.0 *E. acervulina*, 17.5 by 23.7 *E. tenella*, 20.6 by 23.8 *E. praecox*, and 22.9 by 30.4 *E. maxima*. The average measurements in microns of 9 schizonts of *E. necatrix* selected from a large number were 49.2 by 63.1. *E. tenella* proved pathogenic with 24 hr. or less sporulation, *E. acervulina* in 18 to 24, *E. mitis* and *E. praecox* in 24 to 36, and *E. maxima* in 36 to 48. The minimum prepatent period observed for *E. praecox*, *E. acervulina*, *E. mitis*, *E. maxima*, and *E. tenella* was 4, 4, 5, 6, and 7 days, respectively. Self-limitation of infection occurred with *E. mitis*, *E. acervulina*, *E. praecox*, *E. maxima*, and *E. tenella*. Immunity or a high degree of resistance was established against *E. mitis*, *E. acervulina*, *E. praecox*, *E. maxima*, and *E. tenella*.

"Distinct susceptibility was demonstrated to *E. tenella*, *E. maxima*, *E. praecox*, *E. acervulina*, and *E. mitis* in the same fowl, inoculated in the order named. A second fowl, inoculated in reverse order, showed distinct susceptibility to all except *E. tenella*, which was probably due to previous accidental infection with this species. With large dosage, *E. necatrix* and *E. tenella* showed extensive hemorrhage from the small intestine and ceca respectively; *E. maxima* showed slight hemorrhage and considerable viscid mucus from the small intestine; [and] *E. mitis* and *E. praecox* showed slight and moderate amounts, respectively, of viscid mucus from the small intestine. Laboratory-reared fowls between 2 and 3 yr. of age were distinctly susceptible to *E. mitis*, *E. acervulina*, *E. praecox*, *E. maxima*, and *E. tenella*. Infection was accompanied by loss of appetite and markedly abnormal small-intestine feces when inoculated with *E. acervulina* and *E. maxima*. The data offer discouragement to the practice of raising fowls to maturity free of coccidiosis."

Two new Salmonella types isolated from fowls, P. R. EDWARDS and D. W. BRUNER. (Ky. Expt. Sta.). (*Jour. Hyg. [London], 38 (1938), No. 6, pp. 716–720*).—Studies of cultures of *Salmonella* led to recognition of the two species here described as new. The first of these was isolated from a 3-weeks-old poult which came from a turkey farm in Minnesota and is named *S. minnesota*. Its antigenic formula is XXI: *b⇆enx*. The second species, to which the name *S. worthington* is given, was isolated from a young turkey which came from a hatchery at Worthington, Minn. (hence the specific name), and also from a chick, the origin of which is unknown. Its antigenic formula is I XIII XXIII: *lw⇆z*.

Avian tuberculosis infections, W. H. Feldman (*Baltimore: Williams & Wilkins Co., 1938, pp. IX+483, figs. 109*).—Following an introductory discussion, the several chapters of this work consider the biologic characteristics of *Mycobacterium tuberculosis avium;* isolation and culture; diagnosis in chickens, laboratory procedures for demonstrating tuberculous infections in mammals and fowl; the pathologic anatomy of tuberculosis in chickens; experimental tuberculosis in chickens; pathogenicity of avian tubercle bacilli for fowl other than chickens, certain mammals other than man, cattle, swine, and human beings; tuberculin and the tuberculin test; and dissemination and control of avian tuberculosis. Lists of references to the literature accompany the several chapters.

The occurrence of avian tubercle bacilli in dressed poultry, W. H. Feldman (*Jour. Infect. Diseases, 63 (1938), No. 3, pp. 332–336, fig. 1*).—A report is made of the results of examinations of spleens of 125 dressed poultry by culture methods for tubercle bacilli. Four of the spleens examined were found to contain tubercle bacilli. Each strain of the micro-organism secured was identified by tests for pathogenicity. These findings indicate that "dressed poultry originating from districts where tuberculosis of fowl is prevalent may harbor avian tubercle bacilli of standard virulence even though recognizable morbid changes be absent, and tubercle bacilli may be present in apparently normal-appearing fowl reared in an infective environment. These findings suggest that the correction of the situation consists in rearing fowl in a nontuberculous environment. No practical method of post-mortem inspection will disclose the presence of tubercle bacilli in the absence of gross lesions."

Poultry sanitation and disease control, B. F. Kaupp and R. C. Surface (*Chicago: Authors, 1939, pp. 420, figs. 82*).—This practical work, intended to be a complete guide to sanitation and treatment of diseases of poultry, is presented in 21 chapters.

Sulfured soil for poultry yards, M. W. Emmel (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 409, 410*).—The findings in experiments on various uses of sulfur in connection with poultry raising, conducted during the past 3 yr., have shown sulfured soil to be of assistance in the control of diseases met with on premises in which birds must be confined in the same yards continuously. Commercial flour sulfur, consisting of ground run-of-mine sulfur grading 90 percent through 80-mesh screen, obtainable at about half the price of commercial flowers of sulfur, was used. It was broadcast over the surface of the soil at the rate of 800 lb. per acre and mixed with top soil by the use of a rake. The action of soil bacteria on sulfur produces sulfuric acid, which renders the soil acid in reaction, tests having shown that approximately 2 to 2½ mo. are required for the maximum acidity of a pH of 2.0 to 2.2 to be reached in surface soil. Soils sulfured to a depth of 6 in. remain at the maximum acidity for 1 yr., at the end of which free sulfur could still be found. The increased acidity results in the disappearance of all of the intermediate hosts of poultry tapeworms, including snails, slugs, earthworms, etc., whose life cycle definitely is associated with the soil. The life cycle of the common roundworm, whose egg must undergo incubation over a period of time on the ground, apparently is retarded. Pathogenic bacteria probably do not remain viable as long as the pH values of sulfured soil as in cases in which the soil is not so treated.

Paratyphoid and trichomonas infection in pigeons, W. E. Niemeyer (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 434, 435*).—The author records the isolation of *Trichomonas columbae* and *Salmonella typhimurium*—type IV variant—from diseased pigeons in southern California.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the California Station] (*California Sta. [Bien.] Rpt. 1937–38, pp. 81–83, 92–94*).—Briefly noted under the heading of improving the mechanics of crop production are a nutcracking device whereby walnuts are carried over a circular slotting saw, filled from jets in a guide rib with explosive gas mixture, and dropped through a burner so that the meats fall into a center container within a larger receiver for exploded shell, the percentage of whole or half meats being much greater than in hand cracking; a new seed-bean thresher; development of sugar beet machinery; new citrus dusting equipment; orchard-heating problems (fuel, fueling, and burner studies); blowers for frost protection; precooling truck crops for eastern shipment; and poultry house cooling.

[Agricultural engineering investigations by the South Dakota Station], R. Patty (*South Dakota Sta. Rpt. 1938, pp. 6, 7*).—Progress results are briefly presented of investigations on field machinery hitches for tractors and large horse teams, corn harvesting machinery, protective covering and the life of steel fence posts, and rammed earth for farm building walls.

Surface water supply of the United States, 1937.—Part 5, Hudson Bay and upper Mississippi River basins (*U. S. Geol. Survey, Water-Supply Paper 825 (1938), pp. VIII+334, pl. 1*).—This report presents measurements of flow made on streams in these basins during the year ended September 30, 1937.

[Water control investigations at the Everglades Substation], B. S. Clayton and J. R. Neller. (Coop. U. S. D. A.). (*Florida Sta. Rpt. 1938, pp. 154–156*).—Records on cost of pumping were continued, also those on effect of water table depths on crop yields; evaporation and transpiration from sugarcane, saw grass, bare soil, and mulched ground; the subsidence of peat soils; and the surface irrigation of sugarcane.

Public Roads, [March 1939] (*U. S. Dept. Agr., Pub. Roads, 20 (1939), No. 1, pp. [1]+19+[1], figs. 17*).—This number of this periodical contains data on the status of Federal-aid highway, secondary or feeder road, and grade-crossing projects, all as of February 28, 1939, and the following articles: A Study of Sand-Clay-Gravel Materials for Base-Course Construction, by C. A. Carpenter and E. A. Willis (pp. 1–12, 16, 17); and Simplified Computation of Hydrometer Test Data for Soil, by E. S. Barber (pp. 13–16).

New building materials, C. B. Jenni. (W. Va. Univ.). (*W. Va. Univ. Bul., 38. ser., No. 3–II (1937), pp. 108–114*).—The author briefly outlines the nature, method of manufacture, and uses of several of the newer building materials, such as fiber building boards, insulating materials, cellulated clay, gypsum products, fabricated asbestos-cement compositions, concrete including prefabricated forms, glass including translucent masonry blocks, synthetic plastics, and metals.

The use of electricity in agriculture, L. J. Smith, H. N. Colby, and H. L. Garver (*Washington Sta. Bul. 368 (1938), p. 10*).—Studies on comparative cost of cooking with various sources of heat, cost of drying hay, cost of electric heating of water, placement of heating cables in hotbeds, and the use of electric light in stimulating egg production are very briefly reported.

Electric milk refrigeration at the farm, J. E. Nicholas and R. U. Blasingame (*Pennsylvania Sta. Bul. 375 (1939), pp. [2]+38, figs. 29*).—Detailed air temperature and performance data concerning several milk-can cooling arrangements electrically refrigerated were obtained in the milk houses of four farms in the warmest part of Pennsylvania (highest 24-hr. average milk house air temperature 83.4° F.)

Milk cools more rapidly and uniformly in farm electric coolers when the bath water is agitated, and agitation of the cooling water should continue for at least 1 hr. The cooling water should be agitated during the cooling of both morning and evening milk. The average temperature of the evening milk after 12 hr. of cooling with sufficient water may be as low as 33.1° and as high as 40.1°, depending on the amount of refrigeration initially available and the setting of the thermostat. When agitation with sufficient water is employed the average temperature of the morning milk after 1 hr. of cooling may be as low as 42.8° and as high as 49.3°, depending on the amount of refrigeration initially available. A can of milk cools more in the first hour than it does in 11 succeeding hours. With sufficient water level but no agitation of the bath the average temperature of milk after 1 hr. of cooling was 52.5°. When the milk in the cans was stirred and the bath water was not, the average temperature of the milk was not below 50° at the end of the first hour even with a large ice bank on the coils at the start. Milk cools more rapidly under the same thermostat limits with a water: milk ratio of 5 than with a ratio of 3, and more rapidly when some ice is on the coil. The ice maintains the bath water at a low temperature during the first hour of cooling when milk transfers the greatest portion of its heat. If the bath water is agitated and the cans have insufficient water for complete submersion of the milk, the portion which is above the water level will cool slowly. When raining, spraying, or sprinkling of the bath at milk height is practiced, with incomplete submersion of the cans, the average milk temperature is below 50° in the first hour. When a large ice bank is used the water: milk ratio may be small. A pound of ice in melting and warming to 38° is as effective in cooling milk as 150 lb. of water increasing in temperature from 37° to 38°. Milk cools most rapidly when a large ice bank is used with sufficient water level and the water is agitated. If sufficient water and agitation with or without ice on the coil are used the average temperature of the milk is below 50° in the first hour of cooling.

The evening load will warm on the outside of the cabinet in an 82° to 85° room temperature approximately as much as it will if it remains in the cabinet during the cooling of the morning load. At the end of an hour the evening load standing unprotected on the floor in the morning in an 82° to 85° room will average from 1.2° to 5.1° colder than the morning milk cooled 1 hr.

Performance coefficients were determined under various operating conditions, the lowest value obtained being 2.11 kw.-hr. per degree Fahrenheit per gallon, the highest 3.09. In an appendix it is shown by calculation of thermal relations that some ice on the coils at the beginning of cooling will give the best results. An equation for heat transfer through ice under the conditions of milk cooling equipment is also set up and integrated.

The refrigerating data book, I (*New York: Amer. Soc. Refrig. Engin., [1939], 4. ed., vol. 1, pp. [9]+527, figs. [292]*).—This reference book, previously revised at from 2- to 3-yr. intervals, has now been divided into two volumes on refrigerating principles and machinery and on applications of refrigeration, respectively. The first volume, here noted, is scheduled for revision each 4 yr. from 1939, the second for revision each 4 yr. from 1941.

Of this first volume, part 1 takes up principles of refrigeration, basic processes, and data; part 2, refrigerants; part 3, heat flow and insulation; part 4, air conditioning; part 5, properties of foods; part 6, domestic-commercial machinery; part 7, industrial machinery; and part 8, controls and power.

Effect of cleaning seed cotton on lint quality and ginning efficiency, F. L. GERDES, A. J. JOHNSON, and C. A. BENNETT. (Coop. Ga. Coastal Plain, La., Miss., and N. C. Expt. Stas., et al.). (*U. S. Dept. Agr., Tech. Bul. 663 (1939),*

pp. [2]+64, pls. 9, figs. 13).—With hand-picked cottons of wide range of foreign-matter content and staple length, the authors tested a huller front and extractor-feeder with a plain stand, a cylinder cleaner and extractor, and a combination of the cleaner and extractor with a huller stand. The cottons used were practically all below 12 percent in moisture content and were mostly of 1$\frac{1}{32}$-in. staple or less. Cleaning tests on hand-picked and snapped cottons with equipment ranging from minimum to elaborate combinations of cleaning and extracting devices with a huller gin were also made.

Bale-weight decreases due to cleaning and extracting were not so great as the weights of foreign matter removed. The "fluffed" cotton from the cleaning machines could be ginned closer, offsetting part of the trash-weight loss by increased weight of the ginned lint.

Improvements of grade as a result of cleaning the seed cotton by the various methods were closely related to foreign-matter removal by the cleaning units. Greater enhancements in grade generally resulted with the shorter than with the longer cottons and with the cottons of higher than with those of lower foreign-matter content. The measurements of brilliance of the samples gave relationships generally similar to those shown for grade. When the cleaner and extractor were employed singly or in tandem on the cottons of higher foreign-matter content, the quality of the lint ginned with a loose seed roll was increased by an average of one-half of a grade with the shorter and almost one-third of a grade with the longer cottons. The beneficial effects of these units were less with the tight than with the loose seed roll. When cleaning the cotton of low foreign-matter content, changes in grade for the longer staple cotton were negligible, but for the shorter staple cottons the set-ups with the extractor showed some small enhancements. For the third series of tests the improvements from cleaning for the snapped cottons were almost three times those for the hand-picked cottons and increased with the additional cleaners and extractors from 0.5 of a grade with the six-cylinder cleaner set-up to 1.6 grades with the set-up having three cleaners and two extractors. Although the cleaners and extractors greatly improved the grade of lint ginned from the snapped cottons, the most elaborate combination gave an average grade still about one-third of a grade lower than the average grade of the lint ginned from the picked cottons handled by the simple control set-up.

The grade of lint was not affected by increasing or decreasing the speed 100 revolutions per minute from the manufacturer's recommended speed with either the extractor-feeder or the air-line or out-of-air cleaners. The use of air-line and out-of-air cleaners gave similar grade results.

Differences in ginning time between uncleaned and cleaned, picked cotton were generally small except when, in a few instances, the cleaning units so fluffed the cotton that adequate quantities were not fed to the seed-roll box. With the snapped cotton the use of an extractor caused reductions in the ginning time that averaged about 40 percent. The removal of burs made possible a continuous gin-stand operation. Energy consumption of the gin stand showed only small increases when cleaning the picked cotton but indicated economies of 16 percent or larger when the snapped cotton had been extracted.

Industrial waste treatment processes and plant design, E. F. Eldridge (*Mich. Engin. Expt. Sta. Bul. 82 (1938), pp. 103, figs. 31*).—Part 1 deals generally with industrial waste pollutions. Parts 2 to 11 take up, respectively, beet sugar, milk products, metal treating and plating, canning, meat packing, tannery, textile, laundry, and pulp and paper mill wastes and the effect of industrial wastes in sewage treatment plants.

Insofar as the necessary information has been available, the present bulletin takes up not only the treatment processes but also the structures and equipment required for full-scale practical operation of the process. "In some cases the treatment processes are so . . . defined as to allow exact drawings and dimensions to be given. Even cost data . . . [are] possible in a few cases."

AGRICULTURAL ECONOMICS

[**Articles and notes on agricultural economics**] (*Jour. Farm Econ., 20 (1938), No. 4, pp. 741–869, figs. 6*).—Included are articles as follows: Some Fundamentals of Agricultural Policy, by O. B. Jesness (pp. 741–752) (Univ. Minn.); Agricultural Planning and the Agricultural Economist, by O. V. Wells (pp. 753–764) (U. S. D. A.); Theme of Plant and Animal Destruction in Economic History, by C. O. Sauer (pp. 765–775) (Univ. Calif.); Intensity and Land Rent—An Overlooked Aspect of Rent Theory, by C. H. Hammar (pp. 776–791) (Univ. Mo.); Price Discrimination for Agricultural Products, by G. Shepherd (pp. 792–806) (Iowa Expt. Sta.); Lessons from Public Control in Milk Marketing, by J. M. Tinley (pp. 807–822) (Univ. Calif.); and Economic Relationships of Public Lands and Privately Owned Grazing Lands in the Western States, by M. H. Saunderson (pp. 841–853) (U. S. D. A.). Notes are included as follows: A Special Case Consumption-Ratio Formula for the Determination of a Limit on the Price Incidence of a Duty, by C. F. Wells and A. M. DuPré, Jr. (pp. 854–856), and Joint Stock Land Banks in Retrospect, by V. W. Bennett (pp. 857–865) (both U. S. D. A.); and How Should Farm Management be Taught? by W. G. Murray (pp. 865–869) (Iowa State Col.). Also included is the reply to W. A. Morton (Univ. Wis.) by H. Schultz and the rejoinder to this reply by Morton, on the Economic Theory of the Wisconsin Tariff Research Committee (pp. 823–840).

[**Investigations in agricultural economics by the California Station, 1936–38**] (*California Sta. [Bien.] Rpt. 1937–38, pp. 113–122*).—In addition to results previously noted, some general findings are reported for studies of the number of cattle, and shipments into and from the State of stockers, feeders, and finished cattle; of the production, prices, marketing outlets, etc., of prunes; of the shipments and prices of canned asparagus, and results of the new developments in the financial structure of the Poultry Producers of Central California.

[**Investigations in agricultural economics by the Florida Station, 1937–38**] (*Florida Sta. Rpt. 1938, pp. 35–38*).—Included are tables by H. G. Hamilton and C. V. Noble showing the principal reasons why farmers' cooperative associations in Florida have ceased to operate and the proportion of the total State volume of leading fruit and vegetable crops sold through cooperative associations, 1936–37, and a table by Z. Savage and Noble showing the average costs and returns by years, 1932–33 to 1936–37, for late orange groves from 15 to 17 yr. of age.

Current Farm Economics, [February 1939] (*Oklahoma Sta., Cur. Farm Econ., 12 (1939), No. 1, pp. 32, figs. 9*).—Included are the usual tables of indexes of prices, demand deposits, and purchasing power of Oklahoma farm products, and articles on The Agricultural Situation, by M. Hill and A. L. Larson (pp. 2, 3); The Cash Farm Income Situation, by P. Nelson (pp. 3–7); Agricultural Cooperation in Oklahoma, by A. L. Larson (pp. 8–12); The Reciprocal Trade Agreement Program in Relation to Southern Economy, by R. D. Thomas (pp. 12–18); and Cotton Sold in the Seed in Oklahoma, by M. Hill and P. Nelson (pp. 19–27).

Local government in two rural Ohio counties, H. R. MOORE. (Coop. U. S. D. A.). (*Ohio Sta. Bul. 597 (1938), pp. 48, figs. 6*).—Analysis is made of the receipts by sources and expenditures for different purposes by the counties, townships, school districts, and villages in Noble County, representative of the southeastern hill section of the State, and Putnam County, representative of western Ohio. The data for the counties and townships cover the period 1932–36, inclusive, those for school districts, from 1931–32 to 1935–36, inclusive, and those for villages, 1932–34, inclusive, and 1936. The various receipts and expenditures and their trends are discussed.

Kansas oil property taxation in relation to farm taxes, L. F. MILLER (*Kansas Sta. Circ. 195 (1938), pp. 27, figs. 6*).—Data as to total oil production for the tax year March 1935–February 1936, gravity of oil, assessed value of leasehold and equipment, and price of oil were obtained from the records of county clerks, assessors, and superintendents of schools, and the State Corporation Commission. The oil industry in the State and the present method of assessing oil-producing properties are described, and comparison is made with tax rates on such properties in other States. Comparison is made of the value of the product and assessed value of producing property and the average tax rates on oil and agricultural property in the State. Proposed bills, 1915–37, for a severance tax and the proper relationship of a severance tax to present taxes, methods of allocating a severance tax to taxing units, the incidence of such a tax, and its probable effect on oil production, conservation of oil, and probable financial results of such a tax are discussed. "In Kansas, the tax per $100 of gross income from oil-producing property in 1936 was $1.50, while on $100 of gross income from farm property the tax was $8.04. . . .

"It seems that little, if any, of a severance tax in Kansas would be shifted to the consumer of the refined products of the crude oil. This would tend to be true because the speculative nature of crude oil production would tend to prevent reduction in the supply and, therefore, any increase in price. With no appreciable reduction in the supply, a severance tax would have little effect on the conservation of oil.

"The volume of production, the price of crude oil, and the tax rate, all affect the yield of a severance tax. The revenue from a 3-percent severance tax in Kansas would be $2,625,000 if the total production were 70 million barrels and the average price for crude oil was $1.25 per barrel."

Agricultural credit, G. LUNDY (*South Dakota Sta. Rpt. 1938, pp. 4, 5*).—A table showing the number of farm foreclosures instituted in the organized counties in 1936 and 1937, and a brief statement as to the reduction in the acreage mortgaged and debt per acre from 1930 to 1935 in five counties being studied in cooperation with the W. P. A., are included.

Michigan farm business summary—1937, H. A. BERG and C. O. MAY (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 215–225, figs. 5*).—The farm accounts for 1,163 farms for 1937 are summarized in tables showing by type-of-farming areas the acreages, investments, cash receipts and expenses, changes in inventory, net cash and farm income, operator's labor and management wage, percentages of land in different crops, numbers, kinds, and returns from livestock, and labor, machinery, and improvement costs. Other tables and charts make comparisons of the financial returns on Michigan farms 1932–37, and show the number and percentage of farms receiving different operator's labor and management wages in 1937 and percentages of different items of total investments, receipts, and expenses.

Foreign Agriculture, [March 1939] (*U. S. Dept. Agr., Foreign Agr. Serv., Foreign Agr., 3 (1939), No. 3, pp. 85–126, figs. 7*).—Included are articles on The

Hog Industry in France, by H. E. Reed (pp. 87–98), and The Land Problem in Mexico, by C. H. Barber (pp. 99–120); and notes on recent developments in foreign agriculture as follows: More government aid to British agriculture expected (pp. 121, 122), government of Java intervenes to prevent collapse in kapok prices (pp. 122–124), Venezuela's National Coffee Institute reorganized (pp. 124, 125), German-Irish trade agreement extended (pp. 125, 126), and Poland adopts grain-storage program (p. 126).

Contributions from Iowa Corn Research Institute (*Contrib. Iowa Corn Res. Inst. [Iowa Sta.], 1 (1939), No. 2, pp. 163–207, 228–256, 259–279, figs. 15*).—Included are papers with discussions presented at the conference held at Ames, Iowa, May 9 and 10, 1938, and participated in by 60 representatives of wet milling, dry milling, and fermentation industries, farmers' organizations, the Federal Government, and research organizations of various States. In addition to the address of welcome by C. E. Friley and several papers noted elsewhere in this issue, formal papers were presented as follows: The Probable Effect of the 1938 Agricultural Adjustment Act Upon the Supply and Price of Corn: An Introductory Analysis, by O. V. Wells (pp. 165–174) (U. S. D. A.); The Probable Effect of the Agricultural Adjustment Act for 1938 on the Wet-Milling Industry, by F. J. Hosking (pp. 177–190); The Use of Corn in the Fermentation Industries, by L. M. Christensen (pp. 192–201); Effect of the 1938 Agricultural Adjustment Act Upon the Agricultural Industry, by C. Gregory (pp. 202–207); The Effect of Imports Upon the Agricultural and Industrial Demand for Corn: Introductory Analysis, by A. E. Taylor (pp. 228–236); The Effects of Tapioca and Sago Imports Upon the Corn Wet-Milling Industry, by A. E. Staley, Jr., (pp. 237–246); Analysis of the Interests of Dry Millers, by H. Hunter (pp. 248–256); Barriers to Trade Resulting From State Regulations, by F. V. Waugh (pp. 259–262) (U. S. D. A.); and The Effect of Food Laws on Dextrose Utilization, by J. B. Newman (pp. 263–268).

An economic study of farm organization and operation in the High Plains cotton area of Texas, B. H. THIBODEAUX, C. A. BONNEN, and A. C. MAGEE. (Coop. U. S. D. A.). (*Texas Sta. Bul. 568 (1939), pp. 75, figs. 4*).—This is the first of a series of bulletins based on a farm management study of 127 to 141 farms in Dawson, Lynn, Lubbock, Hockley, and Lamb Counties each year 1931–35, inclusive. Detailed financial reports were kept by cooperating farmers with the assistance of a field man, and supplemented by data as to practices used in the crop and livestock enterprises. The topography, soils, climate, agriculture, etc., of the area are described.

The average operator's earnings for the 5 yr. were $223 in 1931, $124 in 1932, $1,808 in 1933, $254 in 1934, and $980 in 1935. Approximately 63 percent of the variations in earnings in 1931 and 1932 were caused by six factors, size of farm, percentage of land in cotton, number of produce animals per 100 acres, acre yield of cotton, return per $100 feed fed to produce livestock, and productive work days per man. Operator's earnings ranged from —$487 on farms below the average in all factors to $1,099 for those above the average in all factors. Size of farm generally was not closely associated with earnings, the net effect of adding 1 acre being to lower the earnings by 54 ct. One percent increase in proportion of farm land in cotton increased earnings $12.80, and an increase of 1 lb. per acre in yield increased earnings $3.62 on an average. Earnings were lowered on an average by $7.18 for each animal unit of produce livestock per 100 acres of farm land, and increased $1.67 by each increase of $1 in the average returns per $100 worth of feed fed. Each additional day of productive man labor, excluding harvesting, was associated with an increase of $3.15 in earnings.

The tobacco industry in Puerto Rico, C. E. GAGE (*U. S. Dept. Agr. Circ. 519 (1939), pp. 54, figs. 18*).—The physiography and climate of the island are described. The types of tobacco grown, cultural practices, diseases, insect pests, grading, preparation for marketing, marketing channels, possible marketing reform, exports and imports of unmanufactured tobacco, tobacco manufactures and consumption, and need for research are discussed.

Trends of yield in major wheat regions since 1885, I, II, M. K. BENNETT (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 14 (1937), No. 3, pp. [2]+69–102, figs. 10; 14 (1938), No. 6, pp. [2]+223–261, figs. 17*).—This contribution is presented in two parts.

Part 1, *General considerations and rising trends.*—This study analyzes the specific influences that seem to have determined the trends of wheat yield in the five regions of rising trend. Initial levels of yield seem to have been relatively unimportant. Some of the trend-increase in all regions resulted from "accidental" influences—either the sequence of stretches of bad and good weather for wheat or statistical inaccuracies, or both. In three regions increase of yield was hampered by internal shifts of acreage, but in two the shifting was favorable to yields. The major part of the trend-increase in yield in all five regions seems assignable to man-made improvement of agricultural technics. Wider use of fertilizers and the development and spread of improved wheat varieties seem to have dominated.

Part 2, *Irregular, stable, and declining trends.*—This study deals similarly to part 1 with trends in nine other regions. Measured by weighted 9-yr. moving averages of annual data, the trends were irregular in four regions and about horizontal in two, while in three they declined. With rough allowance for statistical inaccuracies and vagaries of the weather, it appears that over the major and more recent part of the past half-century the basic trend was upward in two regions, broadly horizontal in four, and downward in three.

In a "world" made up of all these 14 regions and not including Russia and China, the basic trend of yield was upward in the first part of the past half-century and downward in the second part. Agricultural technic has improved with only temporary or local interruption and rapidly enough to overcome persistent drain on soil fertility in most parts of the world. The reversal of trend rests heavily upon the altered distribution of wheat acreage, with large increases mainly in essentially low-yielding territory.

The world wheat situation, 1937–38: A review of the crop year, J. S. DAVIS (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 15 (1938), No. 4, pp. [2]+181–258, figs. 23*).—Scarcity continued to mark the crop year 1937–38, but it was met without severe strain and was significantly tempered by increasing assurance of large wheat crops in 1938. In consequence, the course of wheat prices was downward, in striking contrast to the advances through most of 1936–37. A normal harvest in the United States, the first in 5 yr., accounted for most of the substantial net increase in world wheat production in 1937. Severe crop damage in Canada and Argentina and mediocre out-turns in many other countries were offset by large crops in Australia, Rumania, Italy, and several minor producers. The Union of Soviet Socialist Republics, from big grain crops, exported more than for several years past. International trade in wheat and flour was light, net exports of net-exporting countries totaling only 553,000,000 bu.

Wheat utilization, in the aggregate, was held down by fairly high wheat prices and in many countries by government measures, old and new. The world carryover consequently rose to a figure equal to the average in the presurplus period. Most of the increase was in the United States and in Germany. Even where

carry-overs were below average they were generally ample in view of the abundance that was in sight by the middle of 1938.

World wheat survey and outlook, September 1938 [and January 1939], H. C. FARNSWORTH and H. WORKING (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 15 (1938), No. 1, pp. [2]+1–47, figs. 10; 15 (1939), No. 5, pp. [2]+259–296, figs. 9*).—These numbers continue the series (E. S. R., 79, p. 408).

Shipping and freight rates in the overseas grain trade, V. D. WICKIZER (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 15 (1938), No. 2, pp. [2]+49–120, pl. 1, figs. 15*).—World trade in grain is still the most important employment for that branch of shipping devoted to transport of bulk goods which must move at low cost. Due largely to advances in technology and organization, the trend of ocean freights has been downward for decades, especially in relation to commodity prices generally. Important interruptions to this trend occurred during the World War and in briefer periods before and since, most recently in 1936–37.

Rate variations over briefer stretches of years and fluctuations over periods of months continue to influence the course of trade and international price spreads in grain. Except temporarily, such influences are now overshadowed by those exerted by nationalistic policies which affect agriculture, commerce, and shipping directly and indirectly.

Wheat futures prices and trading at Liverpool since 1886, H. WORKING and S. HOOS (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 15 (1938), No. 3, pp. [2]+121–180, pls. 2, figs. 2*).—The average price of all wheat imported into the United Kingdom seems the most broadly representative of the various price series. For short-period comparisons, prices of Liverpool wheat futures are best of all. Comparisons among these series show that the futures prices are representative of the general level of prices of British imported wheat and are useful for long-period as well as for short-period comparisons. The history of the Liverpool futures contract is one of progressive improvement. A prime objective in the evolution of the contract has been adaptation to the needs for hedging wheat in channels of international trade. "From the standpoint of volume of trading or volume of open contracts, the Liverpool futures market ranks far below Chicago and Winnipeg. It is pre-eminent in balanced reflection rather than in generation of price influences. A large proportion of its business originates with hedgers and with speculators who take a long view of the price outlook. Although peculiarly vulnerable to 'corners' and 'squeezes,' Liverpool has succeeded remarkably in avoiding such manipulation."

The crab apple, commercially considered, E. H. BJORNSETH (*Michigan Sta. Quart Bul., 21 (1939), No. 3, pp. 191–202, figs. 4*).—This study in Allegan County was made in cooperation with the Fennville Fruit Exchange. Tables and charts are included and discussed.

The gross income from crab apples was 4.4 percent of the total gross income from the sale of all kinds of fruit by the exchange. No other fruit crop yielded as regular an income as crab apples. The percentage of U. S. No. 1 crab apples was 72.5 in the period 1931–33 for all members of the exchange and 86.7 in 1934–36 for the principal crab apple growers, as compared with 55.9 for pears, 52 for peaches, and 40 for apples. Prices for crab apples were more or less independent of those for other fruits, following somewhat the prices of other fruits but with less variation from year to year. The total market cost for crab apples varied from 29 ct. per bushel in 1932 to 38½ ct. in 1936. The net income per acre for crab apples was $44.50 in 1935 and $111 in 1936, and averaged $63.66 for the period 1931–36. The demand for crab apples is about the same from year to year, and consequently increase of acreage is not advisable.

Cherry production costs for eight Michigan orchards, 1935–1937, G. N. MOTTS (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 203–213, fig. 1*).—Tables show the labor, power, and spray used per acre, the costs of production by items up to harvest, the cost for harvesting and marketing, overhead costs, the total production costs, and income and profits per acre and per pound. Production costs on the most profitable and the least profitable orchard and the prices received per pound for red cherries by years 1916–37 are compared.

Home-grown farm produce used by the farm household, F. M. ATCHLEY and H. A. BERG (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 179–183*).—Tables show for 156 farms in the southern part and 70 farms in the northern part of lower Michigan, and 29 farms in the upper peninsula the average quantities and value of different farm products used by the farm households during 1937. Another table shows the average amounts used on from 51 to 284 farms in the years 1929–37. The average total values of products used in the three areas were $289.60, $331.63, and $333.55, respectively, and the allowances for house rents $213.38, $139.63, and $157.19, respectively. The annual value of products used during the years 1929–37 ranged from $233.53 in 1933 to $372.47 in 1929, averaging $295.18. Allowances for house rent ranged from $179.60 in 1935 to $222.29 in 1930, averaging $200.12.

Barriers to internal trade in farm products, G. R. TAYLOR, E. L. BURTIS, and F. V. WAUGH (*U. S. Dept. Agr., Bur. Agr. Econ., 1939, pp. VI+104, figs. 2*).—This is a special report to the Secretary of Agriculture by the Bureau of Agricultural Economics. The study was made in cooperation with the various State departments of agriculture, national trade associations, and other organizations. The subject is dealt with in sections on dairy products, margarine, alcoholic beverages, railroad and motor-vehicle regulation, merchant truckers, grades, standards, and labeling, quarantines, and State-financed advertising of farm products. The principal Federal and State laws and regulations and important local regulations are described, and their interference with free trade between States is discussed.

Marketing fruits and vegetables cooperatively, M. C. GAY (*Farm Credit Admin. [U. S.], Coop. Div., Circ. C–110 (1938), pp. IV+78, figs. 9*).—The production areas, factors affecting production, distribution processes and problems, and the growth of cooperative marketing of fruits and vegetables are described. The functions of the cooperative marketing association, the essentials for success, and the organization and operation of such associations are discussed. Appendixes include the Capper-Volstead Act authorizing the association of producers of agricultural products, and proposed organization forms—organization and marketing agreements, articles of incorporation, bylaws, certificates of membership, etc.

Marketing Michigan vegetable crops, H. P. GASTON (*Michigan Sta. Circ. 169 (1939), pp. 26, figs. 7*).—This circular, which is of a popular nature, is based on detailed studies made in the Detroit markets. Most of the material was obtained by studies of actual cases, and the conclusions and recommendations are based on what at least a few growers did or are doing. The material is presented under the headings of growing what the public wants, present grading practices, grading makes selling easier and more profitable, making the pack more attractive, the package, the load, salesmanship, it pays to grow produce which will grade out well, plan production so that sales can be made when prices are high, the chain store outlet, and meeting competition.

The Wilmington market, H. S. GABRIEL (*Delaware Sta. Bul. 214 (1938), pp. 10, 11*).—Some preliminary findings are given as to preference for killed

and drawn fowls, and breeds and number of chickens and turkeys used by restaurants as shown by a survey of 197 consumers, 51 stores, and 21 restaurants.

Refrigerated food lockers: A new cooperative service, L. B. Mann (*Farm Credit Admin.* [*U. S.*], *Coop. Div., Circ. C-107* (*1938*), *pp.* [*1*]+*30, figs. 8*).—Information as to the organization, financing, operating costs, plant layouts, and the possibilities and limitations of cooperative locker plants and associations is given. The study was limited largely to plants in the Middle West, and information was obtained chiefly from operators of private and cooperative local plants, county agents, banks, and manufacturers of equipment.

Crops and Markets, [March 1939] (*U. S. Dept. Agr., Crops and Markets, 16* (*1939*), *No. 3, pp. 49–68, fig. 1*).—Included are reports showing the production of citrus fruits, average 1927–36, 1937, and indicated 1938; mohair and wool production, 1938; prices received by farmers by States for different products, February 15, 1938 and 1939; the prospective plantings for 1939 by States of different crops, with comparison with acreages planted 1938 and average 1929–38; and the usual market reports for cotton, dairy and poultry products, feeds, seeds, grain, and livestock and livestock products.

A graphic summary of farm animals and animal products, O. E. Baker (*U. S. Dept. Agr., Misc. Pub. 269* (*1939*), *pp. 88, figs. 148*).—This publication continues the series previously noted (E. S. R., 80, p. 407). The maps and charts are based largely on data obtained in the Federal Census of 1930 and 1935.

RURAL SOCIOLOGY

[Investigations in rural sociology by the South Dakota Station], W. F. Kumlien. (Coop. U. S. D. A. et al.). (*South Dakota Sta. Rpt. 1938, pp. 48–50*).—The subjects discussed are a social history of the population changes, annual changes of population, and a survey of the aged.

The hop industry, a social and economic problem, P. H. Landis (*Econ. Geog., 15* (*1939*), *No. 1, pp. 85–94, figs. 12*).—The pre-war period production of hops totaled around 52 million pounds per year but decreased during prohibition to approximately 28 million pounds annually. Since repeal, production has rapidly increased to meet the domestic demand. The price received by the farmer has fluctuated almost as violently as production. The cost of growing hops varies greatly with conditions, but the average in Yakima, Wash., during the 1936–37 season was approximately 19 ct. per pound. Hops, much more than most agricultural crops, require a great deal of hand labor during the harvest, which lasts approximately 1 mo. In the Yakima Valley it has been estimated that at the peak of the harvest season 33,000 full-time workers, working 10 hr. a day 6 days a week, were required, and that from 20,000 to 30,000 workers must be drawn from great distances. During the 1935 season, the average wage earned there by men, women, and children was $1.25 per day. Studies in 1937 showed that the average daily earnings of male heads of families were approximately $2, while family members averaged slightly over $1.50. The average rate per pound picked in 1935 was 1.5 ct., in 1937 it was 2 ct.

Hop pickers are acquiring the stigma of a lower class, and this cuts down the supply of local workers. The hop picking population is a very conglomerate group, including some old people, too feeble to engage in more strenuous tasks, and city dwellers chiefly out for a vacation.

Some of the larger growers must employ during the harvest season 3,000 or more workers, which means that a small town must be set up almost over night. Even in the best kept camps it is difficult to maintain sanitary conditions over a period of 3 or 4 weeks, and dysentery and typhoid are a constant threat to the workers and to the community.

The hop industry is a social liability to the community in which it is located in that it attracts a large number of people whom no community wants. The attempt to develop satisfactory market agreements is possibly a step in the right direction. Cooperation among hop growers should help the entire industry. The U. S. D. A. Farm Security Administration working with the State Department of Public Health and the California Medical Association has developed a socialized medical program for all agricultural groups that are unable to pay for medical care. In addition, the Farm Security Administration has been developing on an experimental basis transient labor camps for the migratory laborers who follow the harvest up and down the coast, where the laborers can pitch their tents on clean floors and be assured of clean streets, a pure water supply, a place to bathe, and sanitary toilet facilities. It seems unlikely that the wages of the migrants to the hop harvest will improve materially until the hop grower sees better days.

Minnesota farms and farm jobs: A manual of information for farm placement workers (*[St. Paul.]: Minn. State Dept. Ed., 1937, pp. [4]+98*).—Production areas, types of Minnesota farms, seasonal farm work requiring additional labor, etc., are discussed.

Replacement requirements of gainful workers in agriculture in Ohio, 1930–1940, C. E. Lively (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 109 (1938), pp. [1]+19, figs. 3*).—This bulletin consists of estimates of the number of male gainful workers aged 20 yr. or over in 1930 and engaged in agriculture that will be lost to the industry through death or retirement during the decade 1930–40 for the State and for its subareas; the number of rural-farm males that will live to reach the age of 20 yr. during this decade and who, therefore, may be regarded as potential gainful workers in agriculture; and of the proportion of these potential workers that will be required for replacements.

Race consciousness as reflected in the Negro press, T. G. Standing (Okla. A. and M. Col.). (*Southwest. Social Sci. Quart., 19 (1938), No. 3, pp. 269–280*).—The author discusses the history, content, and function of the Negro press.

Rural youth: Their situation and prospects, B. L. Melvin and E. N. Smith (*Works Prog. Admin. [U. S.], Div. Social Res., Res. Monog. 15 (1938), pp. XX+167, [pls. 24], figs. 13*).—The authors show that rural youth need education and guidance as never before, and also economic, social, and recreational opportunities. "While continuation and expansion of governmental programs for youth are earnestly to be desired, the increased development of nongovernmental programs is equally as urgent."

Out-of-school rural youth in Pennsylvania, C. S. Anderson (*Pennsylvania Sta. Bul. 374 (1939), pp. [2]+34, figs. 6*).—This analysis of the high school and post high school records of 185 rural boys who dropped out of high school before graduation is based on data obtained for Bulletin 342 previously noted (E. S. R., 78, p. 419), information obtained from boys attending the Pennsylvania State College who were former classmates, and interviews with members of the 1933 graduating classes of the high schools included in the previous study. The characteristics of the group are analyzed and discussed, as well as the reasons for leaving school as shown by information furnished by classmates and by the principals of the schools. The study was made 9 yr. after the group entered high school and from 4½ to 8½ yr. after the boys withdrew from school. A little data is included as to girls who withdrew. Some suggestions are made as to means of meeting some of the problems of withdrawals from school.

The mean intelligence quotient of the group leaving school was 88.9 as compared with 94.2 for those completing school, and 55.1 percent of them were definitely retarded. The mean age of the out-of-school boys at the time of entering school was 15.48 yr. (as compared with 14.11 for boys who completed school), and when leaving 17.85 yr. Age retardation correlated definitely with early elimination from school and age acceleration with continuance in school. Approximately 25 percent of those who dropped out of school were reported to have been disciplinary problems. The group dropping out of school had pronounced preference for the study of agriculture and farm shop work and the least preference for academic subjects, particularly languages and mathematics. The group had a very narrow range of recreational interests, 62 percent did not participate in extracurricular high school activities and practically none in intellectual extracurricular activities, and 56 percent were not interested in any known hobby. Occupational preferences while in school had practically no relationship to later employment. About 92 percent of the boys who had dropped out of school were working in 1938, 24.3 percent being in agriculture, 22.6 percent common laborers, and 13 percent doing mechanical work. The reasons given for the withdrawal from school were employment 25.7 percent, scholastic failure 22.8, disinterest 18.9, social maladjustments 7.6, inaccessibility to schools 7.1, home and family influences 6.9, conduct and discipline 4.1, physical difficulties 3.6, past age of compulsory attendance 2.5, and miscellaneous 1 percent.

Human and physical resources of Tennessee.—XXVII, Education: Public and private. XXVIII, Illiteracy, reading habits, libraries, C. E. Allred, S. W. Atkins, and F. M. Fitzgerald (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 81 (1938), pp. [1]+VII+ 418-460, figs. 11*).—Continuing this series of monographs (E. S. R., 80, p. 416), a study is reported of public and private education, the prevalence of illiteracy, reading habits, and libraries.

"Tennessee is handicapped in providing educational opportunities since she has only a small number of adults in proportion to children of school age, relatively low per capita income and per capita wealth. . . . Rural elementary schools are the most poorly equipped of any class of public schools in the State, their average value ranging in 1930 from the $17 per pupil in Hancock County to $122 in Shelby County. The value of school property per pupil enrolled in colored schools was less than one-half that for whites, or $45 and $96, respectively. The number of consolidated schools in Tennessee has increased rather rapidly during recent years due to the combination of many of our smaller rural schools.

"Approximately 7.2 percent of the total population in Tennessee in 1930 could not read or write. This was a decrease of 32 percent since 1880. Males had a higher percentage of illiteracy than females, with 8.4 percent and 6 percent, respectively. However, the proportion of illiterates among Negroes is nearly 3 times that of native whites. A higher rate of illiteracy is found among people 21 yr. of age and over since educational opportunities were not so prevalent formerly as at present. The rural population in Tennessee in 1930 had 8.8 percent illiteracy which was twice that of the urban population. Areas in the State relatively low in total illiteracy are those with either a low ratio of Negro population or a high per capita wealth, or both.

"Tennessee and the South rank low in the extent to which the people read. In 1931 Tennessee ranked fortieth, with an average of 122 magazines circulated per 100 families. . . . In 1932 Tennessee had 48 public libraries containing 650,765 books, exclusive of governmental publications. These libraries are located in 48 towns and cities in 42 counties. Most of the city residents in this

State have access to public libraries but only a small percentage of the rural residents have this advantage."

Recreational development of the Southern Highlands Region: A study of the use and control of scenic and recreational resources (*[Knoxville]: Tenn. Valley Authority [U. S.], Dept. Regional Planning Studies, 1938, pp. XIII+61, [pls. 21, fig. 1]*).—The Southern Highlands Region, it is stated, includes an area of 44,400 sq. miles in 106 counties of 7 States possessing scenic and recreational resources of such quality as to make it potentially one of the major recreational regions of the United States.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agricultural education programs (*U. S. Dept. Int., Off. Ed. Monog. 19 (1938), pp. V+21*).—This monograph makes suggestions for the further development of vocational education in agriculture under the National Vocational Education Acts. It incorporates the results of the discussions and conferences of a committee appointed by the American Vocational Association.

A basis for the improvement of education in rural Monroe County, Indiana, H. L. SMITH and F. R. NOFFSINGER (*Ind. Univ., School Ed. Bul., 12 (1936), No. 2, pp. 165, figs. 37*).—This bulletin contains the findings in a survey made in 1934 by the School of Education, Indiana University, in cooperation with the U. S. Civil Works Administration. Monroe County and the development of education in it are described. The data as to teachers, school districts, and buildings, administrative organization of the schools, daily programs, age, grade placement, intelligence, and progress and achievement of children are analyzed and discussed. The adjustment of the school to pupils is also discussed, and suggestions are made for the improvement of educational conditions in the county.

Agricultural education for adolescents in Pennsylvania, H. G. BUCHER (*Diss., Temple Univ., Philadelphia, 1937, pp. 198, figs. 9*).—This is a dissertation presented to Teachers' College of Temple University. The several chapters deal with the status of agriculture, development of agricultural education, legal provisions relating to agricultural education, agricultural education in relation to school costs and school attendance, need for reorganization of agricultural education, determinants for agricultural education, and summary and conclusions. An appendix (pp. 171–192) deals with significant considerations related to the reorganization of agricultural education, and another includes the author's specific recommendations as to school administration and organization, instruction, pupil activities, and general policy (pp. 193–198).

Homemaking education program for adults, M. S. LYLE and R. VAN HORN (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 195 (1938), pp. VI+125, fig. 1*).—The practices and procedures for organizing and conducting adult programs in homemaking are discussed. Illustrations are given from local communities and States in chapters dealing with the place of such education in the adult education movement; types of State, city, and small-town programs; the preparing of teachers and leaders; procedures for classes; and illustrations of material on organization, programs, lessons, etc.

An exploratory study of the teaching of botany in the colleges and universities of the United States, E. L. STOVER ET AL. (*[Ithaca, N. Y.]: Bot. Soc. Amer., 1938, pp. [2]+46*).—This is the report of a committee on the teaching of botany in colleges and universities appointed by the Botanical Society of America in 1936. It considers certain general features of a questionnaire study and the objectives, content, procedure, and methods of the study, and

an evaluation of student achievement. Lists of supplementary readings are appended.

Teaching the control of loose smuts of wheat and barley in vocational agriculture classes, W. A. Ross and R. J. Haskell (Coop. U. S. D. A.). (*U. S. Dept. Int., Off. Ed., Vocat. Div. Leaflet 3, rev. (1938), pp. IV+11, figs. 4*).—This leaflet includes illustrative material, an analysis of operative training content for the job of treating seed, information in connection with instruction as to seed treatment, and a suggested teaching plan.

4–H club insect manual, M. P. Jones (*U. S. Dept. Agr, Misc. Pub. 318 (1939), pp. 63, figs. 133*).—This manual is planned on the basis of 1 to 3 years' work in 4-H clubs, the first on the identification of insects, the second a study of life histories and control, and a third on demonstrations, exhibits, and surveys. A monthly calendar of club activities is outlined for each year.

Animal pathology and hygiene, R. Graham and J. Sampson (*Springfield: Ill. State Dept. Agr., [1938], pp. 133, [pl. 1], [figs. 67]*).—The cause and methods of prevention and control of common diseases of animals are discussed in 60 lessons for vocational students in agriculture.

Introduction to agricultural economics, F. R. Yoder (*New York: Thomas Y. Crowell Co., [1938], 3. ed., pp. XIX+494, figs. 10*).—This is the third printing of the textbook previously noted (E. S. R., 62, p. 187). Appendixes have been added including statistical tables and a brief description of the agricultural policies of the United States 1927–38.

Farm management: Problems in analyzing, interpreting, and adjusting, L. A. Bradford and R. H. Woods, edited by R. W. Gregory (*Chicago: J. B. Lippincott Co., [1938], pp. VII+216, [figs. 2]*).—This set of problems, references, forms, etc., is designed for use in day school and part-time classes in vocational agriculture, with a view to making the teaching of the problems and principles basic to proper farm organization and management more objective.

A guide to the literature of rural life, compiled by B. Y. Landis (*New York: Amer. Country Life Assoc., 1939, 4. ed., rev., pp. 15*).—Approximately 500 titles of representative books and pamphlets are listed, grouped by subject (E. S. R., 68, p. 558).

Subject matter in money management in junior high school home economics, L. B. Magee (*Diss. Columbia Univ., New York, 1937, pp. 137*).—This Ph. D. dissertation discusses the subject matter in money management as taught in classes in home economics in junior high schools, the duplication of such courses in the fields of home economics and social science, and the extent to which the needs of pupils are being met.

Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations, 1938–39, M. A. Agnew (*U. S. Dept. Agr., Misc. Pub. 335 (1939), pp. V+184*).—This is the usual annual list (E. S. R., 79, p. 273) showing the workers in agriculture and home economics, the personnel of the Office of Experiment Stations, and the officers and standing committees of the Association of Land-grant Colleges and Universities.

FOODS—HUMAN NUTRITION

[Foods and nutrition studies by the Florida Station] (*Florida Sta. Rpt. 1938, pp. 76, 87–89, 127*).—In this annual report summaries, some of which cover an extension of work noted previously (E. S. R., 79, p. 560), are given by R. B. French on the vitamin C content of miscellaneous fruits and vegetables and the effect of home cooking in different ways and with different types of utensils on the vitamin C content of cabbage and cauliflower; by O. D. Abbott, R. Over-

street, and C. F. Ahmann on the nutritive status of children and women in Citrus County, and on the chemical composition and nutritive value of several Florida honeys; by Abbott on the vitamin C content of tomatoes as affected by various factors; and by W. B. Tisdale and R. K. Voorhees on microbiological analyses of orange juice.

[Studies in foods and nutrition of the Washington Station] (*Washington Sta. Bul. 368 (1938), pp. 45–47*).—Included in this progress report (E. S. R., 79, p. 417) are summaries of studies by E. N. Todhunter and R. C. Robbins on the vitamin C content of Winter Banana apples of two harvesting periods, apples of the White Winter Pearmains and Stayman Winesap varieties, and frozen-pack peas, on the distribution of vitamin C in different parts of the Winter Banana apples, and on the vitamin C requirements of college women; by Todhunter on the vitamin C content of frozen red raspberries of the Cuthbert and Antwerp varieties; and of a continuation of the investigation by M. M. Boggs of factors influencing the cooking quality of peas preserved by the frozen-pack process.

Variations in sampling beef and pork roasts for press-fluid investigations, A. M. Child and E. Z. Moyer. (Minn. Expt. Sta.). (*Food Res., 3 (1938), No. 5, pp. 505–512, fig. 1*).—In continuation of previous studies (E. S. R., 74, p. 874) the authors determined the content of press fluid, which consists of moisture, soluble material, and the colloidal fraction pressed from muscle by the pressometer. The results were statistically analyzed to find the degree of variation between samples from comparable slices within a roast, from successive slices proceeding from the center of a roast of beef and pork, and from diffierent cuts of pork. The semitendinosus beef muscle was roasted to an internal temperature of 58° C. at 125° and the longissimus dorsi of pork muscle to 84° at 150°. No significant difference was found in the quantities of press fluid from comparable slices of beef and pork taken at equal distances from each side of the center of the roast, nor between halves of roasts. In the beef roasts the press fluid content decreased progressively from the center to the ends of the roasts, but no such gradient occurred in the pork roasts. Press fluid percentages from the loin end and shoulder cuts of pork were not significantly different, but both cuts contained amounts which were significantly lower than the center cut. The coefficient of correlation between press fluid and total cooking losses did not vary significantly from 0 in the beef roasts, but the pork roasts showed a significant negative correlation.

Effect of coagulation on press fluid, shear force, muscle-cell diameter, and composition of beef muscle, M. J. Satorius and A. M. Child. (Minn. Expt. Sta.). (*Food Res., 3 (1938), No. 6, pp. 619–626*).—In continuation of previous studies (E. S. R., 80, p. 557), the authors investigated the effect of coagulation of muscle on shear force (tenderness), diameter of muscle fibers, total moisture, and ether extract, and of different degrees of coagulation or different internal temperatures of muscle on press fluid, total moisture, total losses, shear force, and diameter of muscle fibers, using the triceps brachii, adductor, and longissimus dorsi muscles of beef. While the tenderness of the triceps brachii and adductor muscles was not affected, coagulation to 58° C. made the longissimus dorsi muscles more tender. The diameter of muscle cells was decreased from 12 to 16 percent, the ether extractable material was increased about 35 to 40 percent, and the total moisture was decreased about 4 percent of the original amount during coagulation to 58°. The press fluid and total moisture were not affected when the internal temperature was increased between 58° and 67°, but both were decreased as the internal temperature was changed from 67° to 75° with total losses increasing with each

increment in internal temperature. Coagulation up to 67° progressively decreased the diameter of the muscle fibers and increased the tenderness. Between 67° and 75° the fiber diameter remained unchanged and the tenderness decreased.

Problems in meat research.—I, Four comparable cuts from one animal. II, Reliability of judges' scores, M. J. Satorius and A. M. Child. (Minn. Expt. Sta.). (*Food Res., 3 (1938), No. 6, pp. 627–635*).—In continuation of the study noted above, the authors report that four comparable roasts homogeneous in physical properties may be obtained from one animal of pork or beef and that the rib and loin ends, weighing about 2 lb. each, from the center pork loin are comparable, as are the seventh-to-eighth and ninth-to-tenth ribs, weighing 7 and 6 lb., respectively, from beef. The small difference in cooking losses need not be considered if the cuts are rotated in an experiment. Using the grading sheet recommended by the cooking committee of the Cooperative Meat Investigations, a panel of five judges found an interdependence existing between flavor and aroma, quantity and quality of juice, flavor-aroma and juiciness, texture and tenderness, flavor-aroma and tenderness, and tenderness and juiciness. No correlation could be demonstrated where mechanical tests were involved between press fluid and shear stress, and press fluid and flavor-aroma. A high correlation existed between the grading-sheet scores for tenderness and the mechanical shear test, with no correlation between quantity of juice as judged by grading and press fluid content. Other factors, such as flavor-aroma, appear to be more important in affecting juiciness than the content of ether-extractable material.

A study of rate of decomposition of haddock muscle at various temperatures as indicated by ammonia content, G. C. Crooks and W. S. Ritchie. (Mass. Expt. Sta.). (*Food Res., 3 (1938), No. 6, pp. 589–598, figs. 3*).—The ammonia produced in fresh and frozen ground haddock muscle kept under different storage conditions was determined as a means of measuring the rate of protein decomposition. A correlation was demonstrated between the amount of ammonia present and the state of preservation as determined organoleptically. With an ammonia content not over 35 mg. per 100 gm. of muscle the fish was sound and of good quality, but when the content reached 60 mg. there was a stale or "fishy" odor which became putrefactive as the ammonia content increased to from 75 to 100 mg. per 100 gm. In fresh ground haddock fillets stored at from 4° to 5° C. for 9 days the ammonia content increased less than 1 mg. per 100 gm., as compared to 153 mg. for samples stored for 9 days at from 9° to 10° and 318 mg. for those stored for 7 days at from 24° to 25°. The ammonia content of frozen fillets did not change appreciably during 28 days of storage, but within 9 days after defrosting the content was 73.1 mg. as compared to 8.5 mg. at the time of defrosting, and after 21 days had reached 183.7 mg. of ammonia per 100 gm. of muscle.

Chemical studies on canned meats [trans. title], Y. Okuda (*Bul. Sci. Fakult. Terkult., Kjuŝu Imp. Univ., Fukuoka, Japan., 8 (1938), No. 1, pp. 16–30, figs. 4; Eng. abs., pp. 27–30*).—The results of previous investigations on chemical changes of muscle protein in canning, the contents of gases and metals in stored cans, and the carbon dioxide and hydrogen gases produced at canning and in storage are summarized. The results of recent studies on the protein, fat, and nutritive value of stored canned meats indicated that (1) proteins from fresh and from canned beef aged for 2 to 15 yr. contained nearly equal amounts of nitrogen but differed widely in ash content, the ash tending to increase with increased length of storage; (2) only slight differences occurred in the analyses of the proteins by the Van Slyke method; (3) no consistent changes

occurred in the composition of the fat during storage except that the total acid value tended to increase with increased length of storage; (4) all fats gave a negative test for vitamin A potency (Carr-Price test); and (5) the nutritive value of canned beef from 2 to 15 yr. of age and of canned crab from 1 to 5 yr. of age showed only slight differences in feeding experiments with albino rats.

A note on yeast obtained from slimy sausage, E. M. Mrak and L. Bonar. (Univ. Calif.). (*Food Res., 3 (1938), No. 6, pp. 615–618*).—The authors report the isolation of *Debaryomyces* yeasts from fresh sausage which closely resembled cultures of D. *guilliermondii nova zeelandicus* Lodder.

Home-preparation of fruits and vegetables for the freezer-locker, H. Carlton (*Tennessee Sta. Bul. 168 (1939), pp. 11*).—Information secured during an extensive survey of the frozen fruit and vegetable industry and freezer-locker installations throughout the country has been assembled for the benefit of those who are desirous of preserving home-grown fruits and vegetables in frozen storage. Suggestions are given for the proper temperatures for freezing and storage, the selection of containers, general preparation of the materials to be frozen, with special directions for fruits and for vegetables, and care in cooking and serving of the frozen foods in the home.

Types of bacteria surviving in frozen-pack vegetables, A. G. Lochhead and A. H. Jones (*Food Res., 3 (1938), No. 3, pp. 299–306*).—In confirmation of the findings noted in a preliminary report (E. S. R., 76, p. 878), species of *Micrococcus* and *Flavobacterium* were found to be relatively more resistant to freezing than the other types of bacteria present in frozen vegetables. Bacterial counts made on vegetables when freshly packed and after 8 mo. of freezing showed that the plates incubated at 37° C. for 2 days had reductions of from 58.6 to 93.5 percent as compared with 80.8 to 94.1 for those incubated at 20° for 4 days, and 95.8 to 99.9 percent for those incubated at 4° for 21 days. In vegetables frozen for 4 mo. the micrococci increased in numbers as the incubation temperature was increased from 4° to 37°.

The effect of Federal and State regulations on the utilization of corn products, W. G. Campbell. (Coop. U. S. D. A.). (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*], *1 (1939), No. 2, pp. 257, 258*).—This is a brief discussion of the terms of the Food and Drug Act applicable to corn products. As an illustration it is noted that the packing of field corn and its sale under a label designating it either as "canned corn" or "canned sweet corn" constitutes an adulteration within the meaning of the law as well as a misbranding.

A quick method of predetermining the culinary quality of potatoes, with special reference to color, E. J. Wheeler (*Michigan Sta. Quart. Bul., 21 (1939), No. 3, pp. 213–215, fig. 1*).—Plugs were extracted from test tubers with a ⅜-in. × 6-in. brass cylinder thrust through the stem and seed ends and middles of the potatoes, and 0.5-in. pieces cut from the ends of each plug were placed in small glass tubes containing 95 percent ethyl alcohol for 1 hr. and then examined for color and shrinkage. Tubers whose plugs or sections remained white and firm in the alcohol cooked white, while those having shrunken and discolored plugs were usually gray or dark colored when boiled. Color, texture, and flavor were correlated closely. Potatoes that cooked white were usually mealy in texture and of good flavor, while those that discolored were often soggy and of poor flavor. This method of testing for quality compared very favorably with cooking tests.

Available carbohydrate and acid-base balance in pulses, K. P. Basu, S. P. Bose, M. A. Quader, and H. N. De (*Indian Jour. Med. Res., 26 (1939), No. 3, pp. 637–644*).—The available carbohydrate in eight varieties of pulses common

in Indian diets was determined by chemical methods to be about 99 percent in *Lathyrus sativus;* 95 in *Phaseolus mungo,* lentil, and *Cajanus indicus;* 92 in *Pisum sativum;* 87 in *Cicer arietinum* and soybean; and about 84 percent in *Phaseolus mungo* var. Linn. From analysis of the ash constituents the potential acidities varied from 1.87 approximate titratable acidity per 100 gm. for *P. mungo* to 5.01 for lentil.

Dry milk solids for cake baking, O. E. STAMBERG and C. H. BAILEY. (Univ. Minn.). (*Bakers Tech. Digest, 13 (1938), No. 6, pp. 103, 104, 107*).—The results of laboratory tests using roller- and spray-process dry milk solids in commercial cake batters are reviewed. The minimum variation in quality of the cake resulted when the dry milk solids were reconstituted in water in the amount of 1 lb. of solids to 1 gal. of water. The method of adding the dry milk solids in the creaming stage was the most satisfactory, while the method of sifting the dry milk solids with the flour was the least satisfactory for loaf and layer cakes. Loaf, sponge, and yellow and white layer cakes of excellent quality were produced when the amount of dry milk solids was 30 percent, based on the flour content, with a concomitant increase in water to maintain a constant viscosity in the batter, and a slight increase in the percentage of baking powder. Two independent groups of judges ranked yellow layer cakes made with 15 percent dry milk solids slightly above those made with fresh skim milk, while those made with 8 percent and 30 percent dry milk solids ranked the lowest. Cakes containing butter up to 50 percent of the shortening scored higher than those made with hydrogenated shortening and were decidedly superior in flavor. It was observed that higher percentages of dry milk solids gave greater stability to cakes and permitted a more favorable formula for the use of butter as part of the shortening.

Altitude vs. baking powder using tentative A. A. C. C. cake formula, M. A. BARMORE (*Cereal Chem., 16 (1939), No. 1, pp. 145–147, figs. 2*).—In a series of cakes made by a modification of the A. A. C. C. formula with cake flour and fresh egg albumen and baked at altitudes ranging from sea level to 10,000 ft., the best products were obtained when the amount of cream of tartar was calculated from the equation $y=-0.03A^2-0.25A+6$, where y equals the cream of tartar in grams and A the altitude in thousands of feet. The addition of 30 gm. of sugar to the formula gave an excellent cake when baked at sea level, but at an altitude of 10,000 ft. the cake fell flat, indicating that the sugar tolerance differs for the same flour at different altitudes.

Salmonella food poisoning: Infection or intoxication? G. M. DACK and E. DAVIDSON (*Food Res., 3 (1938), No. 3, pp. 347–349*).—From a review of the literature, the authors present evidence in favor of infection as the cause of *Salmonella* food poisoning.

The application of isotopic indicators in biological research, G. HEVESY (*Enzymologia, 5 (1938), No. 3, pp. 138–157*).—The use of isotopic indicators in determinations of the rate, place, and sequence of formation of the organic constituents of the body is discussed in this paper.

The use of deuterium in biological work, A. KROGH (*Enzymologia, 5 (1938), No. 3, pp. 185–189*).—The application of deuterium (heavy water) for the study of exchange problems between organic substances and water and for the labeling of organic molecules is discussed in this paper.

[Nutrition studies of the South Dakota Station] (*South Dakota Sta. Rpt. 1938, pp. 33, 34*).—Progress is reported on attempts to determine the distribution of flavin and the antipellagra factor in different organs and tissues of lamb, by E. Pierson.

Digestibility and nutritional value of cereal proteins in the human subject, J. R. MURLIN and H. A. MATTILL (*Jour. Nutr., 16 (1938), No. 1, pp. 15–35*).—An experimental procedure is described by the authors, with the assistance of J. S. Carman and E. M. Austin, for determining the milk replacement value of cereal proteins. The method was studied with six adult subjects receiving a diet in which 80 percent of the nitrogen was from milk, 10 percent from cream, and 10 percent from fruit for a 3-day period, followed by a 4-day period in which the milk was replaced with cereal. The replacement value averaged 93 for wheat endosperm, 89 for precooked rolled oats, and 83 for whole wheat cereal. The biological values of the three cereals, calculated by the Mitchell method (E. S. R., 51, p. 407), averaged 83, 89, and 85, respectively. The apparent digestibility, calculated from the percentage which the cereal nitrogen of the feces is of the amount consumed, averaged 78 percent for the wheat endosperm, 61 for the whole wheat, and 60 percent for the precooked oats. The true digestibility, which does not include the alimentary or endogenous fecal nitrogens, averaged 99, 86, and 85 percent, respectively, for the three cereals.

The egg-replacement value of several proteins in human nutrition, E. E. SUMNER, H. B. PIERCE, and J. R. MURLIN (*Jour. Nutr., 16 (1938), No. 1, pp. 37–56*).—Following the method used in the study noted above, the ability of various foods to replace the nitrogen of fresh whole egg was tested with 10 adult subjects. The basal diet consisted of cornstarch, sucrose, lactose, canned fruits, and vitamin B concentrate tablets, and supplied from 0.4 to 0.6 gm. of nitrogen a day. The experiment lasted 40 days and was divided into 10 periods during which 6.5 gm. of nitrogen were furnished by powdered whole and fresh milk, with and without yeast, wheat endosperm, and egg alone and with yeast. The apparent coefficients of digestibility averaged 80 percent for powdered whole milk, 77 for fresh milk, 73 for fresh milk and yeast, 69 for whole milk and yeast, 70 and 70 for egg and yeast in two periods, respectively, and 77 and 80 for wheat endosperm in two periods, respectively, as compared to 76 and 81 percent for egg protein in two periods. The estimated true coefficients of digestibility averaged 99, 98, 96, 93, 93 and 94, and 95 and 96 percent, respectively, for the different proteins as compared with 97 and 98 percent for egg protein in two periods, respectively.

The biological value of milk and egg protein in young and mature rats, E. E. SUMNER (*Jour. Nutr., 16 (1938), No. 2, pp. 129–139*).—In continuation of the study noted above, using the paired feeding technic of Mitchell and Beadles (E. S. R., 63, p. 393) and the nitrogen "balance sheet" method on 40- to 50-day-old and 1-year-old rats, the authors determined the biological value of dried whole egg protein and of dried milk. At the 8-percent level of feeding the average biological value of egg was 97 and of milk protein 84 for the young rats and 85 and 64, respectively, for the mature rats. At the 5-percent level the egg had a biological value of 94 and the milk of 78 for the mature rats. The coefficients of digestibility in the mature rats were 78 and 92, respectively, for the apparent and true digestibility of the egg and 79 and 95, respectively, for the milk. It is concluded that more protein of good quality is required for growth in young rats than for maintenance in mature rats.

The biological value of milk and egg protein in human subjects, E. E. SUMNER and J. R. MURLIN (*Jour. Nutr., 16 (1938), No. 2, pp. 141–152*).—In continuation of the study noted above, the authors determined the biological value of dried whole egg flake and of whole milk powder in the diets of four adult men. The basal diet included all foods except eggs and milk and supplied about 3 percent of the calories from protein, 24–29 from fat, and 68–72 from car-

bohydrate. The addition of egg or milk brought the nitrogen intakes up to from 3.5 to 5.4 gm. per day. Urine and feces collections were made over a 7-day period following 1 preliminary day on the test diet, and the total nitrogen excreted during the last 2 or 3 days was used in calculating the biological value of the supplements.

The average biological value obtained for egg flake was 65 and for milk powder 62. The coefficients of digestibility were 80 and 92, respectively, for the apparent and true digestibility of the egg and 76 and 90, respectively, for the milk, indicating a slight superiority of the egg over the milk protein.

The egg-replacement value of the proteins of cereal breakfast foods, with a consideration of heat injury, J. R. MURLIN, E. S. NASSET, and M. E. MARSH (*Jour. Nutr., 16 (1938), No. 3, pp. 249–269*).—In continuation of the study noted above, the authors compared the nutritive value of the proteins of seven cereal breakfast foods with egg protein, which is assumed to have a biological value of 100, in a 1-week test on 10 adult men. The basal diet supplied 5 percent of the calories in the form of protein, 44 percent in carbohydrate, and 51 percent in fat, and contained adequate vitamin supplements. The egg or cereal proteins, which were fed during alternate 5-day periods, supplied 78 percent of the total nitrogen intake, the dairy products 11 percent, and fruit and other foods 11 percent.

Representing the extent to which the cereal proteins absorbed replaced egg protein, precooked whole grain oats had an average replacement value of 87, wheat endosperm 72, granulated wheat containing the germ 70, torn wheat 68, toasted "whole" wheat 64, flaked wheat 63, and inflated wheat 57. Whole grain oats also had the highest biological value, a measurement which does not take account of differences in alimentary waste from the body, followed in order by torn wheat, toasted whole wheat, granulated wheat with germ, flaked and inflated wheat cereals, and wheat endosperm. The lower rank of the flaked and inflated whole wheat cereals is believed to be due to the high heat to which they are subjected in the manufacturing process.

Effect of gelatine on muscular fatigue, G. B. RAY, J. R. JOHNSON, and M. M. TAYLOR (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 2, pp. 157–161, fig. 1*).—The daily administration for about 50 days of 60 gm. of gelatin, containing about 15 gm. of glycine and mixed with 8 oz. of orange and lemon juices, to six men exercising on an ergometer increased the work output before fatigue set in from 37 to 240 percent above the level when the subjects were given the same diet without gelatin for about 25 days. During a recovery period of about 35 days when the gelatin was discontinued and the fruit juices alone were given, the work output rapidly fell to about the pregelatin level. Similar tests with four women receiving 45 or 67.5 gm. of gelatin a day produced no appreciable effect on work output.

The iron, copper, and manganese contents of some Philippine foods, F. G. GONZALEZ and A. I. DE LEON. (Univ. Philippines). (*Univ. Philippines. Nat. and Appl. Sci. Bul., 6 (1938), No. 2–3, pp. 177–185*).—In 38 common Philippine fruits and vegetables, the iron content, determined by the thiocyanate method, varied from 0.0645 to 0.7353 percent on the dry basis; the copper content, by the chloroform-pyridine method, from 0.00328 to 0.0028 percent; and the manganese content, by a modification of the periodate method (E. S. R., 66, p. 806), varied from 0.0014 to 0.01268 percent. The green leafy vegetables were richest in the three minerals, followed in order by the vine fruits, roots and tubers, and the tree fruits, as sources of iron and manganese. In copper content the tree fruits ranked ahead of the roots and tubers.

The availability of calcium in spinach, in skim milk powder, and in calcium oxalate, B. W. FAIRBANKS and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr., 16 (1938), No. 1, pp. 79–89*).—In bio-assays conducted by the paired-feeding method the availability of the calcium of fresh, home-cooked, and canned spinach was compared with that of the calcium of skim milk powder. For each 100 mg. of calcium stored by the rats on the milk-supplemented diet 45 mg. were stored on the fresh spinach diet, 44.5 mg. on the cooked spinach diet, and 48 mg. on the canned spinach diet. The milk calcium also promoted a greater rate of skeletal growth as judged by the increase in body lengths of three pairs of rats on each test food. The average retentions of calcium in 10 days were 288 mg. when the diet was supplemented by calcium gluconate and only 82 mg. when calcium oxalate was fed. It is concluded that calcium oxalate is not utilized by the growing rat.

Utilization of calcium of spinach and kale, M. L. FINCKE and E. A. GARRISON. (Oreg. State Col.). (*Food. Res., 3 (1938), No. 6, pp. 575–581*).—Calcium balance experiments were made on two healthy women on diets in which 84.7 percent of the total calcium content of 0.4 gm. in test diet 1 was supplied by kale, 79.9 percent of the total 0.304 gm. of calcium in diet 2 by spinach, and 86.9 percent of the total 0.445 gm. of calcium in diet 3 by spinach. Vitamin B_1 hydrochloride to provide about 300 Sherman units per day was added to diet 1. The other constituents of the diets were soda crackers, butter, sugar, ground lean beef, bacon, tomato juice, weak tea infusion, and sodium chloride, and in diets 1 and 2 cored and pared apple. The daily calcium balances averaged −0.026 and −0.049 gm., respectively, for the two subjects on diet 1 containing kale as compared to −0.096 and −0.131 gm. on diet 2, and −0.149 and −0.164 gm. on diet 3 containing spinach as the chief source of calcium, indicating that the calcium of the kale was considerably better utilized than that of the spinach.

Electrolyte excretion studies in rats maintained on low-Na and low-K diets, E. ANDERSON and M. JOSEPH. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 3, pp. 344–347*).—The metabolism of sodium and potassium was studied by means of radioactive atoms in groups of rats maintained on the low sodium and low potassium diets of McCollum. The rats receiving the low sodium diet excreted 55.2 percent of the radioactive sodium and 7.1 percent of the radioactive potassium within 48 hr. as compared to excretions of 43.8 and 9.5 percent, respectively, by rats receiving the standard ration. The administration of cortin to the sodium-deficient rats reduced the sodium excretion to 49.9 percent and increased the potassium excretion to 14.4 percent. The rats maintained on the low potassium diet excreted 46.7 percent of the radioactive sodium and 6.3 percent of the radioactive potassium within 48 hr. as compared to excretions of 43.8 and 9.5 percent, respectively, by the rats receiving the standard ration.

Urinary excretion of radioactive Na and K in adrenalectomized rats, with and without salt, E. ANDERSON and M. JOSEPH. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 3, pp. 347–350*).—In continuation of the study noted above, the authors report that adrenalectomized rats excreted 60 percent of the administered radioactive Na and 5 percent of the radioactive K within 48 hr. as compared to excretions of 43.8 and 9.5 percent, respectively, by normal rats. The addition of 1 percent of NaCl to the drinking water of the test rats reduced the Na excretion to 45 percent and increased the K excretion to 10.7 percent, indicating that the NaCl enabled the adrenalectomized rats to metabolize Na and K normally.

A study of food consumption in the city of San Juan [trans. title], S. L. DESCARTES and S. DÍAZ PACHECO (*Puerto Rico Col. Sta. Circ. 107 (1938), Span. ed., pp. 51, figs. 19*).—The consumption of 29 different foods by 16,189 persons in 2,645 families, representing 11 percent of the total population of San Juan, was determined by a survey made in the summer of 1937. The families were grouped according to income into five classes with mean incomes of about \$374, \$838, \$1,609, \$2,794, and \$5,182 per year, respectively. The average family group, including servants, contained 6.1 persons. The per capita annual consumption of the various foods is reported as follows: Rice, 132 lb.; beans, 42; potatoes, 71; sugar, 57; coffee, 11.7; bread, 43; soupbone, 30; beef, 26; pork, 10.7; hens and chickens, 18.5; fresh fish, 9.6; codfish, 9.4 lb.; milk, 91 qt.; evaporated milk, 12.2 lb.; condensed milk, 1.3; butter, 5; and butter substitutes, 1.2; cheese, 2.7 lb.; eggs, 13.6 doz.; tomato sauce, 12.2 lb.; sweetpotatoes, 16; dasheen, 27; yams, 7.7; cassava, 0.6; fresh tomatoes, 22; cabbage, 6.2; peppers, 9.9 lb.; lettuce, 20.3 heads; plantains, 109; and bananas, 129. As the income increased the consumption of milk and other dairy products, meat and chicken, bread, potatoes, sugar, and tomato sauce also increased, while the consumption of rice, codfish, and oleomargarine decreased.

Comparison of food intakes for weekdays and for Saturday and Sunday, R. M. LEVERTON and A. G. MARSH. (Nebr. Expt. Sta.). (*Jour. Home Econ., 31 (1939), No. 2, pp. 111–114*).—From the data on nitrogen and calcium intakes collected in 24 balance studies made on girls between the ages of 17 and 24 yr., a significant variation in food intake for weekdays and for week ends is indicated. Fifteen girls served as subjects in studies of 1 week's duration and 8 were subjects for a 10-day period. The percentage differences between the intake for the 5-weekday period and the 3-weekday plus Saturday and Sunday period ranged from 0.6 to 48.5 and averaged 15.9 percent for the nitrogen intake and from 1.1 to 24.1 and averaged 12.7 percent for the calcium intake, and between the 5-weekday period and the Saturday and Sunday period the differences were from 2.3 to 28.8 with an average of 12.5 percent and from 2.7 to 55.2 with an average of 19.6 percent, respectively. Between the 5-weekday period and the calendar-week period the differences were from 0.7 to 16.7 and averaged 6.1 percent for nitrogen intake and from 1.7 to 19.1 and averaged 7.3 percent for calcium intake, and between the calendar-week period and the 10-day period the differences were from 0.4 to 16.6 and averaged 6.5 percent and from 1.4 to 11.2 and averaged 5.5 percent, respectively. The authors stress the need of considering no less than a calendar week as the shortest time unit for studies of food consumption or metabolism.

Summer diets of the poor in Washington, D. C., D. G. WIEHL and C. E PALMER (*Milbank Mem. Fund Quart., 17 (1939), No. 1, pp. 5–28, figs. 3*).—A survey was made by the U. S. Public Health Service with the cooperation of the Milbank Memorial Fund of the food eaten during a 2-day summer period by 602 white and Negro families receiving funds from the Public Assistance Department or having a Works Progress Administration employee or an employed worker. The families were classified into five income groups, ranging from those having less than \$2.67 to those having \$6.67 or more, using a class interval of \$1.33, per food cost unit per week. In analysis of the data, the methods for calculating cost of food and adequacy of diets developed by the U. S. D. A. Bureau of Home Economics were employed.

In the highest income group, the diet of the average white family was adequate in calcium and iron and exceeded the standard allowance for calories and protein, while the Negro diet furnished an excess of calories, protein, and iron, but less than the adequate allowance for calcium. The average diet

of the families in the three median income groups, between \$2.67 and \$6.66 weekly income per cost unit, furnished between minimum and adequate amounts of calories, protein, and iron, and of calcium in all but two groups of white families and in only three groups of Negro families. The average diet of the white families receiving less than \$2.67 a week per cost unit was below the estimated standard allowance for calories and between minimum and adequate for protein, calcium, and iron, while that of the Negro families exceeded the standard allowance for calories, equaled or exceeded the adequate allowance for protein, and was between minimum and adequate in iron and below the minimum requirement for calcium.

Calorie requirements of south Indian children, B. G. Krishnan (*Indian Jour. Med. Res., 26 (1939), No. 3, pp. 631–636*).—The daily caloric intake of 107 boys calculated on the edible portion of raw food eaten during a 7-day period was 870 per capita for 2- and 3-year-old boys, 1,140 for 4- and 5-year-old, 1,300 for 6- and 7-year-old, 1,600 for 8- and 9-year-old, and 1,760 calories for 10- and 11-year-old boys. Compared with the standard widely used in nutrition work in India, the calculated intakes different by +11, +10, 0, +3, and −3 percent, respectively, for the 5 age groups.

Some body measurements of Texas school children, J. Whitacre (*Texas Sta. Bul. 567 (1939), pp. 61, figs. 24*).—This report presents comparisons of the size, body build, and average rates of growth of school children from San Antonio public schools serving as subjects in the extensive investigation, other phases of which have been noted previously (E. S. R., 74, p. 877). Over 7,300 measurements each of weight, and standing and sitting height, and about 3,000 each of shoulder and hip width were made upon 928 white children from 7 to 13 yr. of age, 790 Mexicans from 8 to 15 yr., and 725 Negroes from 7 to 17 yr. of age. The collection of data covered a period of 2.5 school years, during which the pupils were weighed once each month and measured for height once each semester and for width of hips and shoulders once or twice during the entire period.

For all races the rate of growth in weight was the most rapid, followed in general in decreasing order by hip width, standing height, shoulder width, and sitting height. For all races, girls under 10 or 11 yr. and above 15 yr. weighed less and were shorter in both standing and sitting height than boys of the same age, but from 10 or 11 until 14 or 15 yr. weighed more than the boys and were taller in both sitting and standing height. In general, shoulder widths were about the same for boys and girls of the same age in each race. Where differences occurred the measurements for the boys were greater than for the girls, except among 12- and 13-year-old Negroes, the girls of whom exceeded the boys. Girls above 8 or 9 yr. were wider through the hips than boys of the same age, and the differences were more pronounced after 11 or 12 yr. of age.

The white and Mexican children were more alike in their rates of growth in each of the five measurements than were the Negroes, who exceeded the other two race groups in every measurement except hip width of boys, which was the same for all three races. Larger weight gains between 10 and 14 yr. than for other ages were evident in all races, but more conspicuous for Mexican and Negro than for white children. There were more marked differences between average measurements of boys and girls in the Negro than white and Mexican children. Negro children were shorter in standing height and lighter in weight than white children in the age group from 7 to 9 or 10 yr. but taller and heavier above 10 yr. At all ages Negroes were shorter, broader of shoulder, and narrower of hip than white children. The Mexican children were

shorter in standing and sitting height, lighter in weight, and slightly narrower through the shoulders and hips than white children of the same age. In comparison with Negroes of the same age, the Mexican children were lighter in weight, shorter in standing height, and narrower in shoulder width but similar in both sitting height and hip width.

These findings are thought to indicate without question that growth standards for white children should not be used for Mexican or Negro children. A comparison of the data of the present study in the reports of similar studies of comparable groups revealed some striking similarities, as well as certain differences which led the author to comment that "more studies with technics standardized and other conditions as uniform as possible are needed."

Basal metabolic rate in children with abnormal bodily dimensions, M. de Bruin (*Amer. Jour. Diseases Children, 57 (1939), No. 1, pp. 29–51, figs. 13*).—Basal metabolic rates were determined with the Dusser de Barenne and Burger apparatus for 107 children between 1 and 18 yr. of age with abnormal bodily dimensions. The values obtained were interpreted by comparison with the basal metabolic rates of 243 normal children plotted in curves according to the body weight. For determining the basal metabolic rates of children of abnormal size, the rate is based on the actual weight for a well-proportioned child who is too tall or too small for his age, for a thin child, and for a boy with an excess of weight up to 35 percent and a girl with an excess of weight up to 20 percent. For children of greater weights the basal metabolic rate is based on the standard weight for the actual height increased by one-third of the excess over the standard weight.

The results of vitamin and hormone research, II, edited by E. Mellanby and L. Ruzicka (*Ergebnisse der Vitamin-und Hormonforschung. Leipzig: Akad. Verlagsgesell., 1939, vol. 2, pp. XV+520, figs.* [92]).—Following the plan of volume 1 (E. S. R., 79, p. 422), this volume is composed of a foreword by the editors and the following review papers: Vitamins and Dental Caries, by M. Mellanby and J. D. King (pp. 1–54); The Chemistry of the Antirachitic Vitamins [trans. title], by H. Brockmann (pp. 55–103); Physiology and Pathology of the D Vitamins [trans. title], by E. Rominger (pp. 104–159); The Chemistry of Ascorbic Acid (Vitamin C) and Its Analogues, by W. N. Haworth and E. L. Hirst (pp. 160–191); The Physiological Importance of Manganese and Other Trace Elements in Organisms [trans. title], by G. Bertrand (pp. 192–212); Chemistry and Biological Properties of the Carcinogenic Substances, by J. W. Cook (pp. 213–258); The Relationships Between the Sex Hormones and the Formation of Cancer [trans. title], by A. Lacassagne (pp. 259–296); The Chemistry and the Secretion of Insulin [trans. title], by B. A. Houssay and V. Deulofeu (pp. 297–346); The Physiology and Chemistry of the Plant Growth Hormones [trans. title], by A. J. Haagen-Smit (pp. 347–380); The Chemistry of the Flavins [trans. title], by P. Karrer (pp. 381–417); and The Bisexual and Other Effects of Pure Male Sexual Hormones on Females, by V. Korenchevsky (pp. 418–468).

Concerning the toxicity of vitamin A, E. B. Vedder and C. Rosenberg (*Jour. Nutr., 16 (1938), No. 1, pp. 57–68*).—In three series of tests, groups of healthy rats were placed on a diet of Purina dog chow, supplemented by 25,000, 50,000, and 100,000 International Units of vitamin A per gram in the form of jewfish (*Stereolepis gigas*) liver oil, which also supplied from 4,500 to 5,000 I. U. of vitamin D. In a further series, the jewfish liver oil contained 530,000 I. U. of vitamin A, and four fractions obtained by molecular distillation contained from 248,000 to 865,000 I. U., the residue containing 53,000 I. U. of vitamin A per gram. The rats were kept on experiments for

100 days, and the toxic symptoms looked for included retarded growth, eye and nose hemorrhages, rales in the chest, and bone lesions. No sample of the oil was toxic in amounts supplying less than 33,000 I. U. of vitamin A daily, and the toxicity of one lot began at 66,000 I. U. The molecular distillation of the oil apparently separated the toxic substances from the vitamin A. While the addition of vitamin B_1 did not counteract the toxicity, vitamin D had only a partial effect. Five mg. of ascorbic acid daily almost completely counteracted the toxicity of the oil in 11 out of 12 rats receiving the supplement.

Experimental vascular disease in rats produced by multiple depletions of vitamin A, L. Opper. (Univ. Ark.) (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 3, pp. 449, 450*).—In a preliminary study, all but 3 of 24 rats depleted two or three times of vitamin A and given carotene to recover from the recurrent depletions showed some degree of vascular injury. Histological examination revealed degenerative changes in the medial process, affecting almost the entire arterial system, with the exception of arteries within the stroma of the liver, kidney, and spleen. In advanced stages complete closure of the small visceral arteries resulted in myocardial fibrosis.

Vascularization of the cornea of the rat in riboflavin deficiency, with a note on corneal vascularization in vitamin A deficiency, O. A. Bessey and S. B. Wolbach (*Jour. Expt. Med., 69 (1939), No. 1, pp. 1–12, pls. 4*).—Rats maintained on a riboflavin-deficient diet consisting of alcohol-extracted casein 18 percent, Osborne and Mendel salt mixture 4, cod-liver oil 2, sugar 20, alcohol-extracted cornstarch 48, and peanut oil 8 percent were given 40γ of thiamin on alternate days and 2 gm. of riboflavin-free yeast extract daily after the first 10 days.

The rats ceased to grow after 3 weeks, and by the end of the fourth week a marked radial ingrowth of capillaries into the cornea from the vessels of the limbus occurred without any noticeable change in the cornea or any diminution in the transparency. By the tenth or eleventh week the blood vessels extended inward for more than one-third of the diameter of the cornea. The administration of 60γ riboflavin by mouth cleared the turbidity of the cornea within from 12 to 48 hr., while a 20-γ dose daily reduced the number and size of the capillaries in the cornea by the seventh day. After 12 days the vessels could not be seen, and all evidences of degenerative changes of the epithelium and of the tunica propria had disappeared. The condition is described as very similar to the vascularization of the cornea in vitamin A-deficient rats, except that the ingrowth of capillaries occurs concurrently with the epithelial changes in vitamin A deficiency.

The initiation and repair of the condition is suggested for use in testing the biological activity of compounds structurally related to riboflavin.

Night-blindness treated with vitamin A, C. Vaillant and L. Gillis (*Lancet [London], 1939, I, No. 3, pp. 149, 150*).—In this case of night blindness in a young woman, at the end of the first fortnight of treatment with 10,000 International Units of vitamin A daily there was a slight improvement in the biophotometer readings but no improvement in symptoms. At the end of the second fortnight the biophotometer readings were normal and there was marked improvement in the night vision and in general health. On 5,000 I. U. of vitamin A daily the subject has since been able to maintain a satisfactory night vision. As the previous diet history was good and other members of the family on the same diet did not suffer from night blindness, the condition was attributed to faulty utilization of vitamin A rather than to the diet.

Evidence of another factor in the B complex for rats, W. R. Wyatt. (Iowa State Col.). (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 2, pp. 281–*

283).—In an investigation of the possible multiple nature of the filtrate II factor prepared as described by Lepkovsky et al. (E. S. R., 76, p. 839), it is reported that the rat requires at least two factors in addition to vitamin B_1, flavin, nicotinic acid, and vitamin B_6. One of these factors is contained in alfalfa and the other in fuller's earth adsorbate from rice polish extract (fraction 8B) and in molasses and yellow corn. The 8B factor differs from the chick antidermatitis factor, the antiparalytic factor of Morgulis et al. (E. S. R., 81, p. 89), the chick growth factor U of Stokstad and Manning (E. S. R., 80, p. 814), and factor W described by Frost and Elvehjem (E. S. R., 79, p. 137).

New technic for the biological determination of vitamin B_1 with the full-grown pigeon and determination of the comparative vitamin value of the international standard of vitamin B_1 and of pure synthetic vitamin B_1 hydrochloride [trans. title], L. Randoin and P. Le Gallic (*Compt. Rend. Soc. Biol. [Paris], 128 (1938), No. 23, pp. 1052–1054, figs. 2*).—The authors call attention to the fact that in an earlier attempt (E. S. R., 72, p. 884) to determine the vitamin B_1 value of the fuller's earth adsorption product then used as international standard for this vitamin, the basal diet was lacking in other B vitamins as well as in vitamin B_1. Consequently the standard has been re-evaluated and compared with synthetic vitamin B_1 hydrochloride by a new method in which full-grown pigeons were again used, but with a synthetic diet lacking only in vitamin B_1 and with the end point in the preventive tests the numbers of days in which a given dose is capable of maintaining the body temperature of the test pigeon at 41.5° [C.] or above. The diet consisted of casein 6, fibrin 5, albumin 5, butterfat 4, and dextrin 66 parts, all in purified form, and salt mixture 4, agar agar 8, and filter paper 2 parts, with distilled water ad libitum and yeast heated 5 hr. in the autoclave at 120°, 2 gm. per bird daily. Each bird was given 18 gm. of basal diet daily by gavage, together with the autoclaved yeast and a given amount of the test material. The temperature was taken under the wing.

From tests on nine lots of pigeons for each test material, the physiological unit of vitamin B_1, as previously defined, was found to correspond to 38 mg. of the international fuller's earth standard and to 12γ of the pure vitamin B_1 hydrochloride. Consequently the International Unit of vitamin B_1 was calculated to correspond to the activity of 3.1γ of synthetic vitamin B_1 hydrochloride.

***New technic for the biological determination of vitamin B_1 with the* young rat and determination of the comparative vitamin value of the international standard of vitamin B_1 and pure synthetic vitamin B_1 hydrochloride** [trans. title], L. Randoin and P. Le Gallic (*Compt. Rend. Soc. Biol. [Paris], 128 (1938), No. 23, pp. 1055–1057, figs. 2*).—Parallel with the studies noted above, the fuller's earth adsorbate of vitamin B_1 and crystalline vitamin B_1 hydrochloride were compared by experiments on young rats in which, after a preliminary depletion period on a diet deficient only in vitamin B_1, given amounts of the test substance were administered in graded doses to groups of three rats for each dose, and curves plotted for the mean velocity of growth for each group during a 6-week period as ordinate against the dose of the test substance as abscissa. The vitamin B_1 activity of the test substance was taken as the weight of the substance corresponding to the abscissa of the maximum curvature as thus plotted. This corresponded to 14.5 mg. of the adsorption product and 4.5γ of crystalline vitamin B_1 hydrochloride. From these figures *the International Unit of vitamin B_1 corresponded to the activity of 3.1γ of*

synthetic vitamin B_1 hydrochloride, or exactly the same value as determined by the new pigeon test.

A standardized method for the determination of vitamin B_1, G. C. Supplee, R. C. Bender, and L. C. Babcock (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 11, pp. 636–638*).—The method described is essentially a refinement and simplification of the rat curative method of Smith as modified by Ammerman and Waterman (E. S. R., 76, p. 423). Emphasis is placed on the necessity of using a comparatively simple basal diet supplemented with either pure entities or proved concentrates as sources of the other dietary essentials, of maintaining uniformly satisfactory physical conditions of the test animals in spite of the necessity of keeping them at substantially constant weight, of selecting for the test animals showing the same degree of polyneuritis, and of always using the same degree of stimulation in determining whether or not cure has been effected.

The results of the application of the method in a critical and comparative study of vitamin B_1 reference standards are reported and discussed. Vitamin B_1 crystals in the dosage of 3γ now adopted as the International Unit gave cures of paralytic symptoms in 75 percent of 57 trials. The U. S. P. standard clay and the international standard clay adsorption products proved curative in 75 percent of 28 trials and 89 percent of 18 trials in doses of 12 mg. each.

Electrocardiographic changes in vitamin B_1 deficiency, C. C. Dustin, H. Weyler, and C. P. Roberts (*New England Jour. Med., 220 (1939), No. 1, pp. 15–21, figs. 7*).—Case reports, with electrocardiograms, are given for six male patients ranging in age from 34 to 50 yr., all of whom had histories of unbalanced diets with habitual use of alcoholic beverages. All presented clinical evidence of vitamin B_1 deficiency and abnormal electrocardiograms that might have been interpreted as indicative of serious myocardial disease. Under a high vitamin regime with vitamin B_1 medication, all of the patients recovered within a few weeks, during which repeated electrocardiograms at rather close intervals showed a tendency to return to normal. It is pointed out that if the clinical conditions had not been known the interpretation of the electrocardiograms in some cases might easily have been entirely incorrect.

Vitamin values of garden-type peas preserved by frozen-pack method.—I, Ascorbic acid (vitamin C), E. N. Todhunter and B. L. Sparling. (Wash. State Col.). (*Food. Res., 3 (1938), No. 5, pp. 489–498*).—In continuation of previous studies (E. S. R., 78, p. 136), the authors determined the ascorbic acid content and distribution in frozen-pack peas of the Telephone variety, sieve size No. 6, subjected to scalding at different temperatures and for varying periods of time before freezing and of eight other varieties of frozen-pack peas obtained from a commercial canning plant. The Musulin and King modification (E. S. R., 77, p. 743) of the indophenol titration method was followed, and the results were checked by the modified rat bio-assay method of Sherman et al. as previously described (E. S. R., 78, p. 136).

The following mean values were reported for the ascorbic acid content of the peas scalded under different conditions: In steam at 99° C. for 1 min. 0.188 mg. of ascorbic acid per gram; in water at 99° for 1 min. 0.21, for 2 min. 0.185, and for 3 min. 0.17; in water at 88° for 2 min. 0.212, for 4 min. 0.232, and for 6 min. 0.225; in water at 71° for 2 min. 0.081, for 4 min. 0.072, and for 6 min. 0.091 mg. of ascorbic acid per gram. Peas scalded in water 1 min. at 99° after 4 hr. of storage at 21° had a mean content of 0.161 mg. and after 8 hr. of storage 0.206 mg. of ascorbic acid per gram. The mean ascorbic acid content of the seed coats was 0.207 mg. and of the cotyledon 0.137 mg. per gram. Immediately after thawing the peas had a mean ascorbic acid content of 0.17 mg.,

after 30 min. at room temperature had lost 15.9 percent, and after 60 min. the loss was 27.1 percent. Peas which were thawed and then placed in the refrigerator at 4.5° for 24 hr. lost 24.7 percent of their ascorbic acid content.

Compared with the Telephone variety, frozen-pack peas, sieve size 6, of the Thomas Laxton, Laxtonian, Dwarf Alderman, and Duplex varieties showed no significant difference in ascorbic acid content; Improved Gradus was definitely richer; and Laxton Progress, Rogers 95, and Asgrow 40 contained significantly less of the vitamin. The mean ascorbic acid content of the nine varieties ranged from about 0.113 to 0.294 mg. per gram.

Losses of vitamin C during the cooking of certain vegetables, F. Fenton and D. K. Tressler. (Cornell Univ. and N. Y. State Expt. Sta.). (*Jour. Home Econ., 30 (1938), No. 10, pp. 717–722*).—This summarizes the results of a series of studies previously noted (E. S. R., 81, p. 146).

The vitamin C content of Esthonian honeys [trans. title], M. Kask (*Ztschr. Untersuch. Lebensmtl., 76 (1938), No. 6, pp. 543–545*).—Data are reported on the ascorbic acid content, as determined by indophenol titration, of 160 samples of Esthonian honey, 144 of which were unadulterated, 9 adulterated with invert sugar, and 7 with corn sirup. The ascorbic acid content of the unadulterated honeys ranged from 0 to 20 (average of 4.88) mg. per 100 gm. with 78 of the samples within the range of from 2 to 5 mg. and 6 from 10 to 20 mg. The samples containing invert sugar ranged from 0.8 to 4.2, with an average of 1.6 mg. per 100 gm., and those containing corn sirup from 4.8 to 30.7, with an average of 12.9 mg. per 100 gm. No explanation is offered for the high content of the latter samples, but it is noted that the samples low in vitamin C were for the most part light colored and those high in vitamin C brown to dark-brown in color. Among the latter were 4 samples of pine-needle honey, and attention is called to the fact that pine needles have been shown to be very rich in vitamin C.

Analyses are also reported for a varying number of samples of honey of the 1934, 1935, 1936, and 1937 crops. On the basis of the average value of the 1937 crop as 100 percent, the corresponding values for the preceding years decreased to 48.6 percent for 1934. This is considered to represent roughly the loss in the vitamin C content of honey on storage at room temperature and to indicate that honey is a relatively stable medium for vitamin C.

The vitamin C content of Chinese foods, II, T. J. Chu and B. E. Read (*Chin. Jour. Physiol., 13 (1938), No. 3, pp. 247–255*).—In this continuation of an earlier study (E. S. R., 74, p. 134), the vitamin C content of 80 Chinese foods was determined by both iodine and indophenol titration. The data are tabulated by food groups, with comparative values for a few foods as reported in the literature. The materials tested included cereals and cereal products; legumes and legume products; roots, greens, and other vegetables; cucurbits; fresh fruits; nuts, seeds, and dried fruits; vegetable products (sesame paste and lotus root starch); meats, including liver, brain, heart, gizzard, tongue, blood, and muscle flesh; and marine foods. Attention is drawn particularly to the vitamin C content of dried black soybeans 0.4666 mg. per gram by indophenol titration, fennel 0.506, laver (seaweed) 0.611, bitter gourd 0.5646, and black sesame seed 0.3828 mg. per gram.

The vitamin C content of the blood plasma in normal and sick children, F. T. Chu and C. Sung (*Chin. Med. Jour., 52 (1937), No. 6, pp. 791–806, figs. 3*).—As a basis for interpreting blood plasma values of vitamin C in infants and children, simultaneous analyses were made of urine and blood plasma for periods of from 11 to 19 consecutive days in eight infants and children weighing from 6.1 to 23.3 kg. The subjects were kept for a control period of

several days with no addition of vitamin C and then were given daily doses, either as ascorbic acid or orange juice, of about 10 mg. per kilogram of body weight until a state of relative saturation was reached, when about 30 to 50 percent of the test dose was excreted in 24 hr. The periods immediately preceding and following this period were designated as the presaturation and post-saturation stages, respectively. If there was no appreciable response to the test dose in the first 3 days, the subject was considered to be in a deficient or unsaturated state. The determination of the ascorbic acid of the urine was made by the Harris and Ray method and of the blood plasma by the Farmer and Abt method, with tungstic acid for deproteinization (E. S. R., 74, p. 135).

The ranges in ascorbic acid content of the blood plasma corresponding to the different stages of saturation, as determined by urinary excretion, were from 0.17 to 0.41 mg. per 100 cc. for the deficiency or unsaturated stage, from 0.54 to 0.8 for the presaturation, from 0.86 to 1.36 mg. per 100 cc. for the saturation, and from 0.85 to 1.25 mg. for the post-saturation stages. In subsequent plasma tests, all of 11 breast-fed infants gave values of more than 0.5 mg. per 100 cc., while 22 artificially fed infants who had received cow's milk, with and without the addition of cereals and a small amount of dilute cabbage water, gave values ranging from 0.168 to 0.342 mg. per 100 cc. Six artificially fed infants without febrile or infectious diseases were given large doses of vitamin C either as orange juice or ascorbic acid and their blood plasma was analyzed from time to time, with resulting slow and steady increase in ascorbic acid content. Low values were found in infants with acute bacillary dysentery and active tuberculosis even when rather liberal amounts of fruit juices were given.

The authors conclude that the examination of the ascorbic acid content of the blood plasma offers decided advantages over analysis of the urine, particularly because the level of ascorbic acid in the blood shows a gradual and steady increase following vitamin treatment rather than the abrupt change in the urine only at the point of saturation.

Correlation between vitamin C content and complement titer of human blood plasma, F. T. Chu and B. F. Chow (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 5, pp. 679–682, figs. 2*).—To determine whether ar not the serum complement of human subjects can be increased by the administration of vitamin C, simultaneous determinations of complement and ascorbic acid were made over extended periods of time on two children and one woman who were hospitalized but not suffering from febrile, diarrheal, or other diseases which might influence the metabolism of vitamin C and whose intake of vitamin C was raised or lowered during the experimental period by the addition of ascorbic acid to, or its withdrawal from, a constant basal diet. In a second group of 38 patients of different ages suffering from various diseases, single simultaneous determinations of complement and ascorbic acid were made.

The complement and ascorbic acid content data obtained for the first group, when plotted for each subject, showed that the increase in ascorbic acid content of the diet was followed by a rise in complement, as well as in the ascorbic acid content of the plasma, and a decrease by a fall in both. The range of fluctuation, however, was smaller for complement than for ascorbic acid. The values for ascorbic acid in the second group were divided into three classes of deficiency, presaturation, and saturation according to the classification of Chu and Sung as noted above, and corresponding values of complement are presented in a scatter diagram.

The low complement titer values were with few exceptions associated with the deficiency class and the high ones with the saturation class. It is concluded that there is a qualitative relationship between vitamin C intake and complement titer in human plasma, although an adequate explanation of the phenomenon is not clear at present.

Histological investigation of the behavior of vitamin C in various organs during wound healing [trans. title], H. J. Lauber and W. Rosenfeld (*Klin. Wchnschr., 17 (1938), No. 45, pp. 1587, 1588*).—A summary is given of the results obtained in the histological examination by the silver nitrate reduction method of Giroud and Leblond (E. S. R., 77, p. 152) of the adrenals, hypophysis, and reproductive organs of normal guinea pigs and of guinea pigs on vitamin C-deficient and vitamin C-rich diets in which wounds had been produced at the beginning of the experiment. In the animals on the vitamin C-deficient diets the content of ascorbic acid was very low, and none was detectable in the skin or wound tissues, granulation of the wounds was late in forming, and the animals had infections of greater or less degree. In the animals on a normal diet enriched with 100 mg. daily of Redoxon the content of ascorbic acid in the various organs was high, granulation of the wounds was rapid, and ascorbic acid was present in the granulations and adjacent skin.

Investigations on the latent deficiency in ascorbic acid [trans. title], E. Coddeville, H. Simonnet, and J. Mornard (*Presse Méd. [Paris], 46 (1938), No. 95, pp. 1745–1748*).—The authors report a series of studies undertaken to determine the extent of occult or latent vitamin C deficiency in a group of young adults from 20 to 30 yr. of age living on a diet considered normal, and the quantities of ascorbic acid necessary to saturate the subjects.

The Rotter intradermal test (E. S. R., 78, p. 571), with slight modifications, was first applied to nine subjects on the diet without ascorbic acid supplement, to five on the same diet supplemented with 100 mg. ascorbic acid daily for 15 days, and to five others who had received an ascorbic acid supplement of 500 mg. daily for 6 days. Of the first group only two, of the second none, and of the third all required not more than 5 min. for disappearance of the color and were thus considered normal with respect to ascorbic acid saturation. The daily output of ascorbic acid was then determined of subjects of the same age group, in the same mode of life and on identical diets supplemented by 100 mg. of ascorbic acid in one group of nine subjects, 250 in another of five, and 500 mg. in a third of five subjects.

At the end of 30 days the range in daily excretion of ascorbic acid in the first group was from 4 to 20.7 mg. as compared with from 1.6 to 15.4 mg. for the same subjects before beginning the saturation tests. In the second group a marked increase in the quantity of ascorbic acid excreted took place on the fourth, fifth, sixth, and seventh days, respectively (two subjects), and in the third group on the third day (two subjects), fourth and fifth days (two subjects). Experiments are also reported showing that pure ascorbic acid is as effective, as judged by urinary excretion, as an equivalent quantity administered as lemon juice, that the increased elimination of ascorbic acid after saturation drops very rapidly when the treatment is stopped, and that on resumption of the treatment the response in increased elimination is more rapid than the original response. In two subjects tested at frequent intervals during the 24 hr. following the ingestion of 250 mg. of ascorbic acid, the excretion was at its height at the end of 6 hr.

The authors conclude that the adult's requirement for vitamin C is as much as 100 mg. daily, an amount seldom reached in ordinary diets, particularly at certain times of the year. Because of the important role played by ascorbic

acid, not only in the prevention of scurvy but in the defense of the organism against infectious diseases, it is thought to be essential to supplement with ascorbic acid the diet of collective groups (public institutions, the army, etc.).

A comparison of methods for detecting and grading subclinical scurvy, R. A. SLOAN (*Jour. Lab. and Clin. Med., 23 (1938), No. 10, pp. 1015–1026, figs. 6*).—The observations made on 16 scorbutic patients, 2 nonscorbutic patients with bleeding, and 5 normal subjects included, in addition to clinical symptoms and dietary history, (1) capillary resistance tests by the negative pressure technic of Dalldorf (E. S. R., 70, p. 728) and by a modification of the method, which consisted in raising the pressure to 45 cm. of mercury and taking readings immediately before and at 5-min. intervals after the intravenous injection of a test dose of the vitamin and comparing the amount of hemorrhage at the various intervals; (2) urinary ascorbic acid in fresh acidified fasting samples, in 24-hr. specimens before intravenous medication and during oral administration, and in 6-hr. specimens following a test dose of 15 mg. per kilogram of body weight administered by intravenous injection; and (3) blood ascorbic acid by methods similar to the Farmer and Abt macromethod (E. S. R., 74, p. 135) but with proportions of the reagents requiring less dilution of the plasma. In addition to fasting values, blood absorption curves were obtained by analyses of specimens at frequent intervals following the injection of the vitamin.

For the 5 subjects considered normal, the extremes in the values reported were capillary resistance 30 and 55 cm. of mercury negative pressure, fasting urine 0.97 and 14 mg. per 100 cc., 6-hr. urine 41 and 46, fasting blood 0.62 and 1.06, and 4-hr. blood absorption 1.95 and 2.1 mg. per 100 cc., respectively. For the 16 patients suffering from scorbutic symptoms in varying degrees from bleeding gums to severe scurvy with extensive bleeding into the skin and bowels, high, average, and low values before and after treatment with ascorbic acid were capillary resistance 40, 24, and 5 cm. mercury negative pressure before, and an average of 45+ cm. after ascorbic acid treatment; fasting urine 1.9, 0.88, and 0.3 mg. and 5.51, 2.55, and 0.86 mg. per 100 cc.; 6-hr. urine 28, 16, and 2 mg. and 70, 49, and 32 mg.; fasting blood 0.55, 0.28, and 0.06 mg. and 1.49, 1.04, and 0.45 mg.; and 4-hr. blood absorption values 1.59, 0.98, and 0.09 mg. per 100 cc. before and 2.4, 1.86, and 1.2 mg. per 100 cc. after treatment.

In the opinion of the author the capillary resistance test in the majority of cases gives dependable information concerning the presence or absence of vitamin C depletion, but does not indicate the degree of depletion and has one great drawback in the occurrence of falsely negative results due to severe anemia. The examination of a single fasting specimen of urine is not a safe criterion of subclinical or even mild scurvy, but the saturation test gives very satisfactory results with no overlapping. Fasting blood values serve in a rough way to indicate the degree of deficiency but with considerable overlapping, and blood saturation curves give very satisfactory results.

Stability of vitamin D in irradiated evaporated milk, C. H. KRIEGER and H. T. SCOTT (*Food Res., 3 (1938), No. 3, pp. 283–286*).—Using the U. S. P. XI (1936) method, the vitamin D potencies of triplicate samples of irradiated evaporated milk from 22 plants were determined at intervals up to almost 3 yr. after packing. The milk samples assayed close to 135 U. S. P. units of vitamin D per quart when diluted 1:1 with distilled water at time of arrival at the plant. At the end of 1 yr. there was no loss of potency, and after 2 or 3 yr. of storage under moderate temperature changes there was only a slight decrease in vitamin D potency in seven samples within the limits of error of biological assay. Since the average elapsed time between the packing of the

milk and its consumption in the home is from 30 to 90 days, the vitamin D potency of irradiated evaporated milk is assured.

Radiographic demonstration of protection by vitamin D against metaphyseal decalcification in adult rats on high calcium-low phosphorus diet, B. O'Brien and K. Morgareidge (*Jour. Nutr., 16 (1938), No. 1, pp. 91–102, figs. 5*).—By means of a simplified technic, the effects of high calcium, low phosphorus diet No. 2965 of Steenbock and Black were demonstrated radiographically on adult rats during a 52-week period. The radiographic evidence was checked by bone ash analyses of the femurs. It was found that the structures of the proximal end of the tibias are particularly sensitive to changes in mineral metabolism which affect calcification. The addition of vitamin D during the last 18 weeks of the experiment markedly improved the decalcified condition of the skeleton, but the administration of vitamin B complex and of vitamin A had no demonstrable effect.

TEXTILES AND CLOTHING

Progress in methods of wool research, V. Bosman (*Farming in So. Africa, 13 (1938), No. 151, pp. 397–400, figs. 4*).—Methods and apparatus for determining the fineness, tensile strength, resilience, and durability of wool fibers are described, and other wool and body characteristics and statistical methods are briefly discussed.

A study of certain physical properties of various kinds of wool fibers and fabrics, E. Pierson (*South Dakota Sta. Rpt. 1938, pp. 32, 33*).—The complete report on this study, which has been noted previously (E. S. R., 79, p. 572), is summarized. In comparison with the wool of Hampshire, Rambouillet, Shropshire, and Southdown breeds of sheep the tailless fiber ranked intermediate. The tailless fabrics were superior to the other fabrics in tensile strength and bursting strength.

HOME MANAGEMENT AND EQUIPMENT

The farm-housing survey (*U. S. Dept. Agr., Misc. Pub. 323 (1939), pp. 42, pl. 1*).—The data obtained in 1934 from a house-to-house canvass of 595,855 farms in 46 States are grouped geographically into nine divisions and presented in tabular form, showing the acreage of the farms, distribution of owners, non-owners, white and nonwhite operators; age and material of houses; size of house, room use, and number of occupants; water supply and sewage disposal; houses lighted by gas or electricity, central heating systems, refrigeration, types of cook stoves, and power washing machines; condition of house structure; and the reactions of householders to the question of borrowing money for home improvement at a satisfactory rate, with repayments distributed over a 10-yr. period. The data are compared with the 1930 and 1935 agricultural census data. The appendix contains the schedules used in obtaining the information and the general instructions to the enumerators.

Housing requirements of farm families in the United States, M. Wilson (*U. S. Dept. Agr., Misc. Pub. 322 (1939), pp. II+40, fig. 1*).—Based on the data contained in the report noted above, this publication contains information of use to designers and property owners in planning low-cost farm houses suited to the needs of the family and the climate, major land uses, and size and type of farms in every region of the United States.

Planning the kitchen, M. Wilson (*Oregon Sta. Circ. 131 (1939), pp. 32, figs. 26*).—Some of the information contained in a previous bulletin (E. S. R., 80, p. 431) is condensed for presentation in this circular. The kitchen-planning

sions for free floor areas, and descriptions of the centers needed in the average farm kitchen for food preparation, dining, ironing, planning, and child care and play.

MISCELLANEOUS

Toward better agriculture: [Biennial Report of California Station, 1937–38], C. B. HUTCHISON and S. B. FREEBORN (*California Sta. [Bien.] Rpt. 1937–38, pp. X+211, pls. 16*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual report of the director [of the Delaware Station] for the fiscal year ending June 30, 1938, C. A. MCCUE ET AL. (*Delaware Sta. Bul. 214 (1938), pp. 45, figs. 3*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Golden Anniversary Report [of Florida Station], 1938, W. NEWELL ET AL. (*Florida Sta. Rpt. 1938, pp. 198+VIII, figs. 20*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Fifty-seventh Annual Report of the New York State Agricultural Experiment Station, [1938], P. J. PARROTT (*New York State Sta. Rpt. 1938, pp. 44*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual Report of the South Dakota Agricultural Experiment Station, [1938], J. W. WILSON ET AL. (*South Dakota Sta. Rpt. 1938, pp. 55*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-eighth Annual Report [of the Washington Station], 1938, E. C. JOHNSON ET AL. (*Washington Sta. Bul. 368 (1938), pp. 103*).—The experimental work not previously referred to is mostly noted elsewhere in this issue.

State and Federal agricultural publications applicable to Tennessee Valley area (*U. S. Dept. Agr., 1939, pp. [1]+88*).—This is a classified list of publications of the U. S. Department of Agriculture and the experiment stations and extension services of the States in the Tennessee Valley area (E. S. R., 80, p. 433).

Farm Research, April 1, 1939 (*Farm Res. [New York State Sta.], 5 (1939), No. 2, pp. 12, figs. 5*).—In addition to articles noted elsewhere in this issue, this number contains the following: Apply Nitrogen to Apple Orchards Now for Best Results, by R. C. Collison (p. 3); Believes New York State Cheese Industry Has Promising Future, by M. W. Yale (pp. 10, 11); and Long List of Weed Seeds Found in Alfalfa and Clover Seed, by M. E. Woodbridge (p. 12).

Bimonthly Bulletin, [March 1939] (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 4, pp. 51, figs. 6*).—In addition to articles noted elsewhere in this issue and brief abstracts of current contributions to agricultural science, this number contains Crop Production and Disease Control—Wheat, by H. L. Bolley (pp. 30, 31).

Report on agricultural research in Great Britain (*London: P E P (Polit. and Econ. Planning), 1938, pp. [6]+146, [fig. 1]*).—This report is discussed editorially on page 161 of this issue.

NOTES

Colorado College and Station.—Dr. E. P. Sandsten, dean of agriculture and director of the station, and E. B. House, head of the department of irrigation engineering, retired June 30. The former was succeeded by Dr. C. H. Kick, head of the department of animal industry, and he in turn by H. B. Osland, with R. C. Tom serving as acting head until Mr. Osland's return from leave of absence.

J. R. Miller, station editor, has been appointed secretary of the State Board of Agriculture and has been succeeded by Marvin Russell.

Connecticut University and Storrs Station.—Effective July 1, an act of the legislature changes the name of the institution from Connecticut State College to University of Connecticut.

Arrangements for cooperative research have been made between the station department of genetics and the department of gynecology of the Rothschild-Hadassah Hospital, Jerusalem, Palestine.

Delaware University and Station.—The retirement on July 1 is noted of Dr. C. A. McCue, dean and director since 1920 and connected with the institution since 1907. George L. Shuster, professor of agronomy and research agronomist, has been appointed director.

Purdue University and Indiana Station.—Dean and Director J. H. Skinner retired on June 30, terminating a service at the university of approximately 40 years. He has been succeeded by H. J. Reed, assistant director of the station, as dean of the School of Agriculture and director of the station and agricultural extension, with T. A. Coleman as associate director of extension and V. C. Freeman as associate dean.

Kansas College and Station.—The college will receive a total of $2,208,330 in State funds during the ensuing biennium, a decrease from $2,405,199. Included in the allotments are $103,400 for the four substations, $30,000 for veterinary research, and $42,000 for the soil experimental fields.

Eva Stotts, recently appointed instructor in clothing and textiles, was fatally injured in an automobile accident on April 17. She was 31 years of age and a graduate of the University of Nebraska in 1930 and received the M. A. degree in 1937.

Rutgers University and New Jersey Stations.—Dr. William H. Martin, professor of plant pathology and plant pathologist, who has been serving as acting dean and director since the death of Dr. J. G. Lipman (E. S. R., 81, p. 1), has been appointed dean of the College of Agriculture and director of the stations.

Third Commission of the International Society of Soil Science.—This Commission, concerned with soil microbiology, is to meet in New Brunswick, N. J., from August 30 to September 1. It will thus immediately precede the International Congress for Microbiology, which opens in New York City on September 2. The program for August 30 will be devoted to legumes and legume bacteriology, and that on August 31 to the microbiology of soil organic matter and *Azotobacter* and its significance in soil processes. There will also be a conference on legume inoculants and on September 1 an excursion to some of the agricultural regions of New Jersey. Additional information may be obtained from Dr. R. L. Starkey, New Jersey Experiment Stations, New Brunswick, N. J.

EXPERIMENT STATION RECORD

Vol. 81 SEPTEMBER 1939 No. 3

FIFTY YEARS OF EXPERIMENT STATION RECORD

The current issue of the *Record* begins a new half century of service. It was in September 1889 that the Office, then under the direction of Dr. W. O. Atwater, undertook to meet the need which had been visualized in the 1888 report of the Commissioner of Agriculture for "a journal for the stations to contain accounts of their current research, abstracts of similar work in this and other countries, and other matters of mutual interest . . ., in short, a means to provide prompt and constant intercommunication between the stations and bring them from outside what they want to know." This journal appropriately received the title of *Experiment Station Record*.

At the time publication was begun, less than 2 years had elapsed since the first Federal payments to the States under the Hatch Act of 1887. However, experiment stations had been established under its provisions in 40 States and Territories, and in most of these publications had been issued or were under way. A Digest of Annual Reports of the Agricultural Experiment Stations for 1888 had also been prepared by the Office, but this did not include publications other than the annual reports, nor did it meet the need for frequent and regular assembling and summarizing of the considerable amount of new and much-needed information which the stations were bringing to light from day to day and disseminating more or less locally through diverse channels. Furthermore, it made no adequate provision for the furnishing to the stations of the "advice and assistance" contemplated by the Hatch Act, and gave no opportunity for the exercise of leadership by the Office in bringing the stations together and coordinating their work.

Volume 1, number 1, of the *Record* therefore was gotten out by the Office staff as the beginning of "a current record in brief outline of the results of experiment station and kindred work." Besides the abstracts of station literature, provision was made for including "brief accounts of the publications and work of this Department and such information for station workers and others interested in agricultural science as may from time to time be deemed advisable."

Editorial notes, later expanded into formal editorials, were begun in the second issue for the discussion of topics of direct interest to the stations, and news notes with volume 2 as "a helpful means for keeping the stations advised of one another's work and plans and for showing the general public more of the spirit and tendencies of the stations, the kinds of work they are doing, the aid and recognition they are receiving, and the advances they are making."

The need which was realized from the beginning of acquainting station and Department workers and others with current research in agricultural science outside the United States was met in part in 1890 by the inclusion of publications from Canadian institutions and a few months later by an extension to other foreign countries. During the next two decades this feature of the work was developed to the point of a reasonably complete coverage of the world's major findings in agricultural science.

The expansion in scope was accompanied by some condensation of abstracts, but was primarily made possible by an enlargement of space. Volume 1 dealt with some 280 reports and bulletins and, aside from indexes and tables of contents, contained 325 printed pages. Volume 20, published in 1908–9, consisted of 1,200 pages of comparable material including 5,336 abstracts. Three years later the two volumes which were being brought out annually contained a total of 7,841 abstracts and 1,800 printed pages of abstracts, editorials, and notes.

The 1912 maximum of 1,800 pages plus about 300 pages of indexes and contents continued without change until 1929, when the advancing cost of printing brought about the abolition of the detailed table of contents from each issue and a consequent reduction of about 100 pages per year. Nine years later similar causes led to a curtailment in the space available for abstracts. At that time a readjustment of printing costs resulted in the omission of an entire issue of 144 pages and an abridgment of 4 later issues by 16 pages each. Data recently compiled for the fiscal year ended June 30, 1939, indicate that the total shrinkage in space from the previous year has been over 200 pages, or 12 percent, while the total number of abstracts decreased from 7,218 to 6,746, a reduction of 6.5 percent.

Since the past quarter century has been a period of marked expansion of research agencies in the fields of agriculture and home economics, the problem of adequately covering the literature in the space available has become increasingly acute. Under the prevailing conditions, full coverage remains of the technical publications of the experiment stations and the Department and of the many contributions of the staffs of these agencies which find publication through scientific journals and other nonofficial mediums. Mate-

rial from other sources, however, is necessarily subject to an increasingly rigid selection.

The extent of the service which the *Record* has thus far rendered may be visualized in part by the fact that volumes 1–80 contain nearly 280,000 separate abstracts. The original articles included not only the entire scientific output of the Department and the approximately 50 State experiment stations, but hundreds of other research agencies and individuals, using more than a dozen languages and located all over the world.

Author and subject indexes have been provided from the beginning, and combined subject indexes have been issued for volumes 1–12, 13–25, 26–40, 41–50, 51–60, and 61–70. A similar combined index for volumes 71–80, covering the 5-year period ended last June, is in preparation. The total number of entries in the combined indexes as a whole probably far exceeds half a million.

The usefulness of so extensive and unique a compendium of information has long since been widely accepted. Although with the passing of the years the *Record's* own bulk has been an increasing handicap to its preservation by individuals, it has become well-nigh indispensable to libraries and many other institutions as a work of reference. The Office has cooperated in many instances in the completion of files for this purpose, and is still in a position to render considerable assistance in this direction. A moderate stock is even available for all of the combined indexes aside from that for volumes 13–25.

For obvious reasons, continuity of policy and consistency of treatment has been the rule in the management of the *Record*, but numerous innovations have been put into effect in recent years, notably the conserving of as much space as possible for abstracts by curtailment of the editorials and news notes and abstracts of the station annual reports. These changes were made in response to a questionnaire sent out to the experiment stations in 1931 and discussed in detail at that time (E. S. R., 66, p. 401). Other suggestions are always in order, and will receive full consideration from the point of view of increasing the effectiveness of the *Record* as far as possible with the means available.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The chemical composition of rayless goldenrod (Aplopappus hartwegi), T. F. BUEHRER, C. M. MASON, and J. A. CROWDER. (Univ. Ariz.). (*Amer. Jour. Pharm., 111 (1939), No. 3, pp. 105–112, figs. 2*).—*A. hartwegi* was found to contain an unusually high percentage of resins, the highest, namely, 25 percent, being found in the leaves, and approximately 8 percent in a composite of the entire plant. The essential oils, present to an extent of 1.24 percent in the entire plant, were found to conform to the empirical formula $C_{10}H_{18}$ and to have the properties of the menthene group of the terpene series. The chloroform extract from material digested with concentrated sodium hydroxide yielded hydrochlorides which reacted as typical alkaloids toward the usual reagents. The crystals obtained on evaporation were found to contain 4.31 percent nitrogen, which partially confirms the qualitative tests.

Pyridine is evolved when the plant material is steam distilled from strongly alkaline solution. Microscopic and chemical tests confirmed the presence of pyridine in the distillate. Quantitative analysis indicated 2.04 percent pyridine on the dry-plant basis.

Ouricury palm kernel oil, R. S. MCKINNEY and G. S. JAMIESON. (U. S. D. A.). (*Oil & Soap., 15 (1938), No. 7, pp. 172–174*).—Ouricury palm fruits from Florida, as well as the oil expressed from the kernels imported from Brazil, have been investigated. The fruits consisted of 47.5 percent of pulp and 52.5 percent of palm nut, of which the kernel amounted to 23.8 percent. On the basis of the whole fruit, the oil in the pulp amounted only to 0.9 percent. The kernels from Brazil contained 69.7 percent of oil, some of the characteristics of which were as follows: Saponification value 256.9, iodine number (Hanus) 14.69, thiocyanogen value 12.78, Reichert-Meissl value 5.93, Polenske number 18.38, and unsaponifiable matter 0.27 percent. The percentages of fatty acids found in the oil were as follows: Caproic 1.66, caprylic 9.10, capric 7.64, lauric 42.7, myristic 8.43, palmitic 7.15, stearic 2.15, arachidic 0.96, oleic 12.18, and linoleic acid 2.04 percent.

Attention is called to the importance of not assuming the presence in distilled ester fractions of the lower homologues of oleic acid from deductions made only from calculations using the iodine number and saponification value of the fraction without confirmation by other evidence. The present investigation has shown the danger of such assumptions.

Stillingia oil, G. S. JAMIESON and R. S. MCKINNEY. (U. S. D. A.). (*Oil & Soap, 15 (1938), No. 11, pp. 295, 296*).—An American stillingia oil expressed from combined California, Florida, and Texas seed gave an iodine number of 176.1, a saponification value of 211.7, a thiocyanogen value of 102.7, and the following percentages of acids: Oleic 7.7, linoleic 56.3, linolenic 24.6, palmitic 4.42, stearic 1.43, and arachidic acid 0.34. A sample of Chinese oil gave an iodine number of 169, a saponification value of 206.2, and a thiocyanogen value of

100.7, and the following percentages of acids: Oleic 10.4, linoleic 49.9, linolenic 25.4, palmitic 5.89, stearic 2.64, and arachidic acid 0.14. From the characteristics and composition of these samples it would appear that stillingia is suitable for use in the manufacture of paints and varnishes.

Action of wheat amylases on soluble starch, O. E. Stamberg and C. H. Bailey. (Minn. Expt. Sta.). (*Jour. Biol. Chem., 126 (1938), No. 2, pp. 479–488, figs. 4*).—The authors obtained preparations designated α-amylases 1 and 2, respectively, from germinated wheat by direct alcohol precipitation and by alcohol precipitation following heat treatment. Precipitations designated β-amylases 1 and 2 were obtained from normal wheat by direct alcohol precipitation and by acid treatment of the extract followed by alcohol precipitation, respectively.

Hydrolysis of soluble starch by the β-amylase preparations was about 60 percent, by α-amylase 2 about 40 percent, and by α-amylase 1 and malt diastase about 85 percent, as determined by the reducing power in terms of available maltose. α- and β-amylase apparently attacked the same portion of the starch. With a yeast-manometric method and soluble starch as substrate the pure α-amylase 2 produced mainly nonfermentable reducing dextrins, together with some fermentable reducing sugars. The other enzyme preparations produced fermentable reducing sugars equivalent to the reducing value.

An electronic voltage regulator with supplementary circuit to supply low voltages, E. B. Working. (Kans. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 8, pp. 434, 435, figs. 2*).—"To secure voltage regulation an approximately fixed voltage above the negative side of the line is established by means of a gas-discharge tube (a neon glow lamp with resistor removed from the base, or a type 874), in series with current-limiting resistors. This voltage is applied to the cathode of a tube of high amplification, such as type 6J7. A bleeder across the output which is to be regulated is tapped at a point which will be approximately 3 v. negative to the fixed voltage when the output is at the voltage desired, and this tap is connected to the grid of the 6J7. Any change in output voltage is thus amplified and is applied to the grid of a power tube, as a type 6L6, placed in the positive line to carry the entire output current." Details of a circuit based on this principle are described and shown in a hook-up diagram.

Antifoaming device for use in concentration of noninflammable liquors, E. A. Gastrock and J. D. Reid. (U. S. D. A.) (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 8, p. 440, fig. 1*).—The device described consists essentially of a loop of Nichrome wire helix attached to heavier copper leads and placed in the distilling flask above the liquid so that when electrically heated the coil breaks the foam bubbles before they come in actual contact with it by evaporating the film.

In the form of the device here illustrated, 88 cm. of 22-gage Nichrome wire were wound into a helix, the helix was bent into a circular loop, and its ends were attached to 16-gage copper leads, passing through the stopper of the distilling flask. The loop was placed in a 2-l., or larger, flask so that it might be spaced at least 4 cm. from the glass above it. The coil was heated from the 110-v. lines, a 500-w. heater being put in sockets as a control resistance, with another similar heating unit so connected as to be put in parallel with the first unit by closing a switch. The arrangement "has proved successful in the laboratory distillation and concentration of alkaline pulping liquors that foam excessively and should prove useful in the distillation of many aqueous foam-producing solutions. There appears to be no reason why it should not be applicable to large-scale apparatus."

A simple apparatus for the rapid determination of moisture by the carbide method, E. T. FUKUNAGA and L. A. DEAN. (Hawaii Expt. Sta.). (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *43* (*1939*), *No. 1, pp. 3–5, fig. 1*).—The authors describe an apparatus consisting essentially of a gastight bomb equipped with a pressure gage in which the weighed soil sample is placed in the larger, and an excess of pulverized commercial calcium carbide in the smaller, of two separate containers. After gastight closure of the bomb the smaller container is upset to mix the carbide with the soil sample, and the moisture content is determined from the pressure and temperature readings. In all cases "a constant difference was found to exist between the two types of measurement. Consequently, the utility of the rapid method as an aid to irrigation control is suggested if the critical soil moisture constants of specific soil types are predetermined on the calcium carbide basis."

The paper is accompanied by an editorial note by F. E. H[ance], in which are included data from eight determinations of soil moisture compared with data for the same samples obtained by the oven-drying method at 102° C.

A method for obtaining a continuous measurement of soil moisture under field conditions, G. J. BOUYOUCOS and A. H. MICK. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31* (*1939*), *No. 3, p. 271*).—Since the dielectric constant of plaster of paris is proportional to its moisture content, a measure of the conductivity of a standardized block of this material is a measure of soil moisture. Conductivity determinations are easily made by means of electrodes and a form of the Wheatstone bridge. "This device measures soil moisture ranging from the wilting point to the field capacity, or it is really a measure of the available water. It denotes the wilting point accurately. By knowing the wilting point and the available water, the total water content is thereby also known."

Determination of potassium by means of an aqueous solution of trisodium cobaltinitrite in the presence of nitric acid, L. V. WILCOX. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 9* (*1937*), *No. 3, pp. 136–138*).—An aqueous solution of trisodium cobaltinitrite replaces the familiar two-solution reagent. Nitric acid, rather than acetic acid, is used as the acidifying agent to maintain the nitrate-nitrite equilibrium and thereby prevent nitrite decomposition. The resulting precipitate is granular, heavy, and easily filtered and washed. The gravimetric and volumetric procedures for the determination of potassium by this new method are described. The normality of the oxidizing solution bears a stoichiometric relation to the potassium of the precipitate, and the equation for the reaction is shown. The absolute accuracy as well as the reproducibility appears to be within ±0.05 mg. expressed as potassium.

Microscopical determination of potassium with naphthol yellow S, H. A. FREDIANI. (La. State Univ.). (*Indus. and Engin. Chem., Analyt. Ed., 10* (*1938*), *No. 8, pp. 447–449, figs. 2*).—"Potassium may be determined qualitatively in the presence of ammonium by means of naphthol yellow S. Ammonium, cesium, lithium, magnesium, and sodium ions do not react with the reagent to form insoluble crystalline salts. Cupric, lead, rubidium, and silver ions form precipitates and may mask the microscopical test for potassium."

Determination of small amounts of potassium, D. S. BROWN, R. R. ROBINSON, and G. M. BROWNING. (W. Va. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 10* (*1938*), *No. 11, pp. 652–654*).—The authors describe a simple and more rapid form of the cobaltinitrite method, ceric sulfate being substituted for potassium permanganate in the titration, while the precipitation is carried out at room temperature. It was found that the usual variations of room temperature do not affect the accuracy of the determination of from 0.6 to 1 mg. of potassium, but when the quantity experimentally deter-

mined was reduced to 0.2 mg. recoveries were too high at 0° C., close to the exact quantity at 20°, and somewhat low at from 25° to 30°.

Filtering before addition of platinic chloride in the analysis of fertilizers for potash, H. R. ALLEN. (Ky. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 1, pp. 162–167*).—Ignition in a silica dish gave a larger residue, less soluble in acid alcohol, than did ignition in platinum. Filtering the residue out before platinic chloride was added gave slightly less potash, and potash was sometimes found in the material removed. The amount of residue filtered from ignition in silica, if counted as potassium oxide, would increase the potash content erroneously in some instances. Residues obtained after ignition in platinum were small, particularly when hydrochloric acid was added when the ignited material was dissolved in the dish. Ignition in platinum, solution of the ignited salts in hydrochloric acid and water, and determination of potassium chloroplatinate by weighing the filter, crucible, and contents, leaching out, and weighing the crucible gave the most potassium oxide. One drop of tributyl citrate in the digestion prevented foaming.

The citrate solubility of dolomite of varying particle size, C. W. WHITTAKER, L. F. RADER, JR., and K. V. ZAHN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 1, pp. 180–189, figs. 2*).—Experiments on an ammonium citrate solution adjusted to pH 7 as solvent for evaluating the solubility of dolomite as contained in physiologically neutral fertilizers indicated that this reagent is unsuitable for control work by reason of excessive variation in the results obtained with mixtures differing in age and composition. "It is felt that during the growing season the MgO is probably about equally available to plants in all cases in spite of the fact that its solubility in the neutral ammonium citrate varied widely. . . . No doubt real differences in the solubility existed and were measured with more or less accuracy by this reagent, but its extreme sensitivity to the age and composition of the mixture makes it unsuitable for use in the routine determination of the solubility of magnesium."

The authors are of the opinion that 2 percent citric acid, ammonium citrate solution of pH 4, and citrated ammonium nitrate solution should give more uniform results. The solubilities of the MgO in these solutions are much higher than in ammonium citrate solution of pH 7, and alterations in the state of combination of the magnesia in the fertilizer would, therefore, have less effect.

Decomposition of dolomitic limestone in soils when used as a neutralizing agent in complete fertilizers, P. R. DAWSON, E. F. SNYDER, W. R. LEIGHTY, and F. R. REID. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 1, pp. 137–141*).—This paper reports preliminary results of studies on the comparative decomposability of dolomitic limestone of different degrees of fineness when applied to soils as the neutralizing agent in non-acid-forming fertilizers. The experiments now in progress comprise pot trials in which the dolomitic materials are applied to the soil as constituents of a complete netralized fertilizer and are allowed to react with the soil in the presence of a growing crop under conditions simulating those in the field. The comparative rates of decomposition of the dolomites are evaluated by the changes in pH, the residual carbonates, and the readily soluble magnesium in the soil of the fertilizer placement zone, as well as by the changes in magnesium content of the crop, after each of several successive treatments and crop periods.

Iron determination in presence of titanium, using zinc reduction, E. TRUOG and R. W. PEARSON. (Wis. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 11, pp. 631, 632, fig. 1*).—After passage of the sample solution through a Jones reductor, the appearance of a violet color indicates the presence of 0.1 mg. or more of titanium. This may be selectively oxidized by

adding 50 cc. of distilled water containing the normal quantity of dissolved air. If the quantity of titanium is less than that which gives a violet color to the solution, keeping the volume of the solution down to from 200 to 250 cc. and stirring vigorously for 3 min. in a 400- or 600-cc. beaker will effect an aeration sufficient to oxidize the titanium, leaving the iron salts unaffected.

A dithizone method for measurement of small amounts of zinc, P. L. Hibbard. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed., 9 (1937), No. 3, pp. 127–131*).—The zinc having been brought into solution by suitable means, this solution is made alkaline by ammonia, a chloroform solution of dithizone is added, and the mixture is shaken and let stand a minute to separate. If zinc is present it combines with the dithizone in chloroform and colors it red. The intensity of color is proportional to the amount of zinc, which may conveniently be from 0.001 to 0.020 mg. The amount of zinc may be also measured by a titration procedure, using approximately 0.001 N bromine in carbon tetrachloride.

Improved molybdenum blue reagents for determination of phosphorus and arsenic, J. A. Schricker and P. R. Dawson. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 1, pp. 167–179, fig. 1*).—Determinations of minute quantities of phosphates in soil extracts, plant material, etc., were found to be affected both by the buffer action of appreciable concentrations of salts and by the composition of the ceruleomolybdate reagent.

The ranges of concentration of sulfuric acid, molybdic oxide, and reduction over which color intensity remains practically constant were determined. The conditions for minimum interference of yellow tints, silica, and salt effects were shown to require the minimum reduction and molybdic oxide concentrations and the maximum sulfuric acid concentration compatible with uniform and complete color development. Modified molybdenum blue reagents meeting these requirements used in the proportion of 1 part per 100 parts of test solution have a sulfuric acid concentration of 36 N, reduction concentration of 0.04 N, and molybdic oxide concentration of 0.18 M and 0.32 M for phosphorus and arsenic, respectively. In composition they conform to 0.02 M $Mo_{10}O_{29}$ and $Mo_{17}O_{50}$ for phosphorus and arsenic, respectively. "Preparation of the reagents themselves requires little time and care, but on the other hand, temperature and time are important factors in actual color development up to the point where a final stable end point is reached. Great precision may be obtained by measuring the colors in a photoelectric colorimeter, as little as 1γ or less equivalent of phosphorus being readable."

Quinaldine red in place of β-dinitrophenol as an indicator for preliminary adjustment of the pH of the test solution is recommended. Sulfurous acid is recommended instead of sodium bisulfite to prevent arsenic and nitrite interference in highly buffered and salt-containing solutions such as soil extracts.

An alternative method for phosphorus, specifying a sulfomolybdic acid reagent corresponding in concentration to the molybdenum blue reagent and methol as a reducing agent, is also described.

The use of a Taylor phosphate slide comparator for the determination of phosphates in soil extracts, T. C. Longenecker. (N. J. Expt. Stas.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 362–364, fig. 1*).—Because of the limitations of the spot plate method, a search was made for a more reliable method, rapid enough to fit in with the remainder of the soil testing procedure. The Taylor phosphate slide comparator appeared to fulfill these requirements. The procedure was found to consume very little more time than the spot plate method, and the concentration of phosphorus could be determined to within 5 p. p. m.

The preparation of suitable reagent solutions is described, and manipulative detail is given.

Determination of phosphorus in fruits and fruit products, H. W. GERRITZ. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 1, pp. 131–137, fig. 1*).—The proposed method, found by the author to be more convenient and accurate than volumetric procedure and comparable to the official gravimetric method, consists essentially of the molybdenum blue phosphate determination. Minor modifications have been introduced to adapt Zinzadze's method more specifically to the use of the neutral wedge photometer and to the analysis of samples prepared by wet ashing.

Determination of arsenic, A. K. KLEIN and F. A. VORHES, JR. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 1, pp. 121–130*).—Having separated the arsenic from organic matter, either by a solvent procedure or by wet oxidation, the authors reduced the arsenic to a trivalent form by means of potassium iodide and acid, formed and extracted arsenic xanthate by treatment of its solution with sodium ethyl xanthate in carbon tetrachloride and alcohol solution, washed out interfering substances dissolved by the carbon tetrachloride by means of concentrated hydrochloric acid containing stannous chloride, evaporated the carbon tetrachloride, oxidized the arsenic to the pentavalent state by adding bromine, developed the molybdenum blue color with the Zinzadze reagent (E. S. R., 74, p. 585), and completed the determination by means of a neutral wedge photometer.

A rapid potentiometric method for determination of sulfate, B. E. CHRISTENSEN, H. WYMORE, and V. H. CHELDELIN. (Oreg. State Col.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 8, pp. 413, 414, figs. 5*).—The authors found a change in the electrode potential at the equivalence point in the titration of sulfate solutions with barium chloride solutions when a trace of persulfate had been added. The break was neither large nor very sharp in purely aqueous solutions, but was more marked in the presence of from 25 to 60 percent of methanol. Ethanol and acetone also sharpened the end point indication, but the methanol gave the best result. It was found that the quantity of persulfate should be 1 mg. or less. When the sulfate concentration was less than 0.05 N the break was too slight to be used, and when the sulfate concentration was greater than 0.25 N the precipitate was too heavy for the best results. The end point occurred not at the stoichiometrical end point but at about 95 percent of complete precipitation. The titration should be performed in nearly neutral solution, since in acid or distinctly basic solutions the results were poor.

Dichlorofluorescein and potassium chromate as indicators in the argentometric estimation of salt in butter, K. G. WECKEL. (Univ. Wis.). (*Jour. Dairy Sci., 22 (1939), No. 3, pp. 163–168*).—The results of a series of tests comparing dichlorofluorescein and potassium chromate as indicators in the routine analysis of butter showed that the mean of the titrations using the former was consistently and significantly less than for the latter. When a single salt solution prepared from recrystallized sodium chloride was titrated with silver nitrate, using first potassium chromate and then dichlorofluorescein, the latter results were in closer agreement with the calculated percentage of salt than the former.

Determination of sugars in plant materials, W. T. FORSEE, JR. (Fla. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 8, pp. 411, 412*).—Using an alkaline solution of a specially purified potassium ferricyanide as oxidant, the author was able to determine glucose satisfactorily by measurement in a photoelectric colorimeter of the diminution of the intensity of the

yellow color of the ferricyanide solution. He finds that "precise results can be obtained with samples containing from 0.05 to 0.4 mg. of reducing sugars," in a rapid and simple procedure requiring but one standard solution.

A method of estimating the volatile products liberated from stored fruit, F. GERHARDT and B. D. EZELL. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 7, pp. 493–503, fig. 1*).—The authors established optimum conditions for the quantitative oxidation of acetaldehyde by excess of standard ceric sulfate solution in dilute sulfuric acid, the unused oxidant being titrated iodometrically with standard sodium thiosulfate. The reaction as used for this determination was empirical rather than stoichiometrical, the cerium equivalent of acetaldehyde having been 6.8. The acetaldehyde volatilized from stored fruit was found to be absorbed by sulfuric acid from an air stream of 10 l. per hour, the average acetaldehyde recovery being 97.2 percent.

A precise method for the determination of carotene in forage, D. W. BOLIN and A. M. KHALAPUR. (Idaho Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 8, pp. 417, 418*).—The authors extracted the carotene with 95 percent alcohol and saponified fatty matter in this solvent. They then extracted the carotene and xanthophyll with petroleum spirit, and removed xanthophyll from the petroleum spirit solution with 85 percent methyl alcohol. This procedure is recommended on the ground that it avoids the formation of emulsions, permits the use of definite quantities of reagents, and gives more accurate results than do the customary procedures.

Improved method for estimating carotene in feeds, G. S. FRAPS and A. R. KEMMERER. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 1, pp. 190–194*).—The authors found it possible to activate some samples of U. S. P. light magnesium oxide in a manner such that it will adsorb xanthophylls from solutions of carotene and xanthophyll but leave the carotene in solution. Other samples, however, did not yield an activated adsorbate showing this selective action, and the method given requires testing of each preparation on purified carotene solutions and on xanthophyll solution. Crude carotene solutions may be purified by magnesium hydroxide showing the correct selective adsorption and the remaining color read as that of pure carotene.

Departures from additivity among Lovibond red glasses in combination with Lovibond 35 yellow, G. W. HAUPT (*Oil & Soap, 15 (1938), No. 11, pp. 282–287, figs. 4*).—The author studied 2,700 Lovibond red glasses in groups of 1,000, 1,000, and 700, all three studies showing departures from additivity of such a magnitude as to be capable of introducing serious discrepancies in the grading of vegetable oils if such glasses were used without calibration. Both regular and erratic departures from additivity were observed.

Evaluation of washing compounds and compliance with bottle washing standards, C. R. ARNOLD and M. LEVINE. (Iowa State Col. et al.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 18 (1938), No. 3, pp. 82–84*).—The authors tested four commercial alkali bottle-washing preparations, comparing these with 1.5 percent sodium hydroxide solution at body temperature with *Staphylococcus aureus* as test organism and at 140° F. with the highly resistant *Bacillus metiens* as test organism. In these tests and in time tests also carried out the sodium hydroxide solution was definitely superior to any one of the four preparations compared with it.

Alpha cellulose from sugar cane bagasse and foliage, R. ARROYO. (P. R. Expt. Sta.). (In *The Puerto Rico Sugar Manual. New Orleans: A. B. Gilmore, 1938, pp. 26, 27*).—The process described entails grinding to between 10 and 20 mesh-particle size; steaming in a manner which removes dirt, together with much of the waxy matter and color; compressing and air-drying; immersion

overnight in 50 percent normal butyric acid containing about 2.5 percent of acetic acid, followed by 6 hr. heating in this reagent in reflux; washing; air-drying; heating with sodium hydroxide solution of 4° B.; bleaching in 7.5° bleaching powder solution; a second sodium hydroxide treatment in a solution of 15°; a second bleaching in 5° bleaching powder solution; immersion in 2 percent butyric acid overnight; washing out of the acid; and drying.

Cane bagasse yielded from 33 to 38 percent alpha-cellulose prepared in this way. Cane straw yielded from 25 to 28 per cent. The author considers that this product, from 92 to 95 percent alpha-cellulose and from 0.25 to 3 percent ash, should sell for no less than $75 per ton.

Colloids in the sugar mill, H. P. Kortschak (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *43* (*1939*), *No. 1, pp. 33–43*).—Colloids, the removal of which may become necessary in sugar mill practice, are here grouped into three classes, the first consisting of colloids present in cane juice itself or derived from the cane stalk and designated "inherent colloids," a second group of "extraneous colloids" coming from any material which enters the mill other than cane stalk, and a third group of "process colloids" formed as a result of manufacturing procedure. In the first group are included pectin, together with pectic acid and its salts; pentosans; proteins; waxes; fats and fatty acids; polyphenols (coloring matters and tannins); and starch. In the second group, and including the most troublesome colloids met with in the sugar mill, are the organic and inorganic soil colloids. The process colloids mentioned are glucose decomposition products and sugar salts. The effects of these various colloids upon clarification, filtration, evaporation, and crystallization are discussed.

Preparing and processing apple juice, R. E. Marshall. (Mich. State Col.). (*Mich. State Hort. Soc. Ann. Rpt., 67* (*1937*), *pp. 42–48*).—The author here briefly reviews the necessary equipment and the various steps in the process of preparing a clarified and filtered apple juice of high quality.

The utilization of surplus plums, W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 18* (*1938*), *Nos. 3, pp. 72–74, 89, 91, figs. 2; 4, pp. 101–105, fig. 1*).—The author suggests that plums may be crushed in an ordinary apple crusher and packed in barrels or enamel lined cans and stored indefinitely at a freezing temperature for use in jams and jellies. Cull plums of sound quality will give as good jams and butters as higher priced fruit. Jam pulp may also be made from cull plums. Other products considered are canned sauce, jelly, jelly juice, candy and candy base, beverage sirup, preserves, dehydrated plums, canned and bottled beverage, and canned fruit.

Fermentation of orange juice as affected by the addition of nitrogenous nutrients, A. J. Nolte. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16* (*1937*), *No. 12, pp. 360–362, fig. 1*).—The fermentation of sweetened orange juice was stimulated by the addition of such nutrient materials as ammonium carbonate and distillers' malt. The most favorable range of concentration of ammonium carbonate has been found to be between 0.9 and 1 gm. per liter, that of distillers' malt to be 0.5 percent when the starter consists of a malt infusion. Because of the inconvenience of preparing distillers' malt, ammonium carbonate is considered more suitable. The aroma and taste of the new wine from must to which ammonium carbonate had been added as a yeast nutrient was better than that of the wine from control batches to which no nutrient salt had been added. Of eight strains of yeast studied, that designated No. 2338, *Saccharomyces ellipsoideus* Hansen I, was found to be the most suitable from the standpoint of its vigor and of flavor produced in the finished wine. The wines had a pleasing bouquet, but none had an odor and taste resembling that of orange juice.

AGRICULTURAL METEOROLOGY

Certain ecological factors and the cotton plant, B. JOHNSON and C. H. WADLEIGH (*Arkansas Sta. Bul. 376 (1939), pp. 51, figs. 47*).—The weather factors (monthly rainfall, rainy days per month, monthly mean maximum temperature, monthly mean and cumulated monthly mean minimum temperatures, and a combination of monthly rainfall and monthly mean maximum temperature) in relation to the cotton plant as expressed by yield of lint were studied (1919–35) for the six eastern counties of Arkansas, either for March to October, inclusive, or in some cases for the months of greatest growth of the plant. In general, rainfall in April, May, and July showed high correlations with yields, but in June there was less covariability. The best yields were associated with rainfall at or near the minimum reported for these months, provided these small precipitations were properly distributed. Increasingly high monthly mean maximum temperatures in May, June, and August were associated with increased yields, while such increases in July (above 93° F.) and in September (above 86°) were associated with decreasing yields. The relations of monthly mean and cumulated monthly mean minimum temperatures below the annual mean for several months to yield of cotton resulted in the largest standard errors of estimate, and perhaps had less direct relation to yield than the other factors considered. As to the relation of the combination of rainfall and monthly mean maximum temperature to yield, the importance of April, May, and July in this association is made more evident. July mean maximum temperature showed a very high correlation in this relationship, but June rainfall and monthly mean maximum temperature had relatively low correlation coefficients in this association, as they did in the other relationships studied in June.

Graphs of the regression surfaces of the joint relation of certain weather factors and location of county to yield are presented, the relationships varying from county to county and in some cases the slopes of the curves being markedly different. In general, however, the trend in the individual counties was similar to that of the entire area studied. However, the importance of the trends in the subregions (counties) of highest yields may greatly affect the mean yield from the total area, and this condition is discussed and the effects in the several subregions are presented.

Climate and agriculture in California, M. K. BENNETT (*Econ. Geog., 15 (1939), No. 2, pp. 153–164, figs. 9*).—This is a general discussion of the relations of climate to agriculture in California, considered under climatic diversity, characteristics of climate, concentration and character of agriculture in the State, and the agricultural prospect.

Weather phenomena of the Colorado Rockies, R. L. IVES (*Jour. Franklin Inst., 226 (1938), No. 6, pp. 691–755, figs. 20*).—Field observations indicated that the major portion of Colorado's moisture is brought in by the winter cyclones. Winter winds redistribute the snow, and Chinook winds remove a portion of it from the mountains and adjacent plains. Summer storms of three types tend to redistribute the moisture derived from the melting snow. The regional and local or valley storms, of almost daily occurrence, are topographically confined convection phenomena, which daily transfer small amounts of moisture across divides. Cyclones tend to augment the violence of both other types, while anticyclones inhibit the regional storms but have a negligible effect on the local storms. Numerous barometric, electrical, and optical phenomena of great interest but minor climatic importance are described briefly. Theories explaining the various phenomena are presented, and possible applications of

the results of this and further studies of mountain weather conditions are suggested. Sixteen references are included.

Precipitation and water supply in the Sierra Nevada, California, E. ANTEVS (*Bul. Amer. Met. Soc., 20 (1939), No. 3, pp. 89–91*).—Since the normal precipitation and water supply and the extremes of the dry and wet periods are of great importance for future developments in the Sierra Nevada region, the author examines and discusses the published records and interpretations of facts so far as available since the area was first settled by white man about 1850. The records include fluctuations of Eagle, Tahoe, and Mono lakes in relation to changes in the relative amounts of snow and rain and the behavior of glaciers, and the factors involved in tree growth on the Truckee.

Floods of Ohio and Mississippi Rivers, January–February 1937 (*U. S. Geol. Survey, Water-Supply Paper 838 (1938), pp. XII+746, pls. 25, figs. 97*).—The main part of this paper is a report by N. C. Grover, presenting records of stage and discharge for the period including the floods at about 250 measurement stations, records of storage in many reservoirs, a summary of peak discharges with comparative data for other floods at about 470 measurement points, and tables showing crest stages along an aggregate length of stream channel for 5,000 miles. The report also includes basic information in regard to the weather associated with the floods, results of detailed studies of the rainfall and run-off, analyses of the volume of floodwaters in the surface channel systems during the progress of the floods, and much related information.

Following the main flood report is a brief report by G. R. Mansfield on "flood deposits of the Ohio River, January–February 1937, a study of sedimentation," in which mechanical analyses of deposits are grouped into 12 location categories, and geological evidence as to the present and preceding floods is considered. The possibilities of the data presented as a basis for flood control measures are pointed out.

The determination of evaporation from land and water surfaces, C. W. THORNTHWAITE and B. HOLZMAN (*U. S. Mo. Weather Rev., 67 (1939), No. 1, pp. 4–11, pls. 2, figs. 5*).—The importance and complexity of the problem of determining rate and amount of evaporation from land and water surfaces or transpiration from vegetation is stressed. In an effort to supply much-needed information, a method for determining evaporation from either land or water areas is presented in this preliminary report and its practicability is said to be demonstrated. It is also hoped that with proper instrument installation it will become possible to determine transpiration rates and moisture requirements of various field crops and forest trees, the effectiveness of various moisture-conserving practices, and the relative importance of evaporation and transpiration in the hydrologic cycle.

Evaporation studies.*—III, *Ten years of evaporation at Wooster as measured with black and white atmometers, J. D. WILSON (*Ohio Sta. Bimo. Bul. 197 (1939), pp. 11–25*).—Continuing this series (E. S. R., 79, p. 584), a State-wide survey was begun in Ohio in 1926 and data have been accumulated as daily readings from black and white atmometers from May 1 to September 30 each year since. The average (10-yr.) monthly values from the black and white atmometers and a standard evaporation pan were in the same order of magnitude for the 5-mo. period, July values being the largest, followed in decreasing order to September. The effect of radiant energy was responsible for ±29 percent of the total water loss from the black atmometer for the 50-mo. period. Evaporation was above the average for the 10-yr. period in 1930, 1932, 1933, 1934, and 1936, and droughts of varying severity occurred in these years, as well as in 1928 and 1929. The drought of 1930 was most severe. Evapora-

tion-rainfall ratio values for each of the 50 mo. indicated that rainfall exceeded evaporation in only 13 of them, whereas evaporation was in excess by at least 50 percent in 24 of the 50 mo. and was at least twice as great in 18 of them. Twelve droughts were recorded for the period 1928–37. Those falling in May and June were particularly injurious to oats and early garden crops, those in July and early August reduced corn yields, and those in late August and September were least important, affecting chiefly the seeding of wheat. Correlations and variations between pan and atmometer records are discussed in detail. Indications were that the pan is more influenced by variations in the radiant energy and temperature factors than is the atmometer. The monthly variations for the pan losses corresponded most closely to those for sunshine duration, followed in turn by those for temperature, relative humidity, and wind. The average value of an hour of sunshine in terms of water evaporated from a black atmometer was largest in June, followed by July, August, September, and May, in that order.

Meteorological phenomena affecting low temperatures on experimental peat bog, J. H. Neal. (Minn. Expt. Sta.). (*Agr. Engin., 19 1938), No. 6, pp. 273–277, figs. 2*).—For some years it has been known that frosts may occur on peat bogs in any month of the year. Some of the factors involved are air drainage, depth of subdrainage, depth and compactness of the peat, dryness of the surface, and vegetation. The usual weather conditions found on the day preceding a frost were a low maximum temperature and a dropping to 55° F. or less by 10 p. m., a high barometric pressure (usually rising), a clear sky, and a northerly wind of a low velocity. Weather conditions on the day of the frost, except for the early morning, had no bearing on frost occurrence. In case of wind changed from northerly to southerly, or the sky from clear to cloudy shortly after midnight, frosts were usually warded off, though conditions the evening before may have indicated a frost. Although each particular bog will have certain local conditions affecting temperature, it is deemed very likely that the probability of a frost can be predicted along the lines discussed with a fair degree of accuracy after these local conditions are known.

Second note on the logarithmic law of wind structure near the ground, H. U. Sverdrup (*Quart. Jour. Roy. Met. Soc. [London], 65 (1939), No. 278, pp. 57–60, figs. 2*).—The author critically reviews his own work and that of others and presents formulas and graphs, concluding that very near the boundary surface stable and unstable conditions influence the wind profile and the eddy convectivity according to the same law, that certain observations can be interpreted as showing that the roughness parameter of the surface is a well-defined physical quantity, and that the influence of stability can be expressed by means of a nondimensional constant. He believes that the wind profile at greater distances from the boundary surface is represented better by a power than by a logarithmic law.

Protecting the sugar industry from losses due to hurricanes, G. E. Howe (In *The Puerto Rico Sugar Manual. New Orleans: A. B. Gilmore, 1938, pp. 14–23, figs. 16*).—The stated object of this article is to present in a simple manner information on buildings for use by the sugar industry. Puerto Rico being located in the hurricane region, the destructive effects of great windstorms have an important bearing on building design in this and similar areas. The author therefore presents data relating to wind velocities and pressure and the principles on which buildings should be constructed to resist hurricanes.

Sulphur dioxide content of air at Boyce Thompson Institute, II, C. Setterstrom (*Contrib. Boyce Thompson Inst., 10 (1939), No. 2, pp. 183–187*).—In view of the importance of SO_2 as an atmospheric contaminant, and because

of the widespread disagreement as to the harmful effects on plants of low concentrations of the gas, a continuous record was kept from November 1, 1936, to November 1, 1938, with minor interruptions. The results for the first year have been reported previously[1] with descriptions of the methods used, sources of SO_2, and the condition of the vegetation. The present paper summarizes the data for the second year. For the periods reported the average concentration including zero readings was 0.035 p. p. m., and the maximum recorded was 0.53 p. p. m. SO_2 was present in concentrations of 0.01 p. p. m., and above, 60.6 percent of the time. Meteorological records indicated that prevailing wind directions were much the same for both periods.

The sunspot period, H. H. Clayton (*Smithsn. Misc. Collect., 98 (1939), No. 2, pp. [1]+18, pl. 1, figs. 12*).—Since the sunspot period is becoming important in numerous fields of scientific activity, much significance attaches to the forecasting of the time and intensity of the maxima and minima. The present paper attempts to show that the smoothed plus and minus annual departures from normal pressure observed in the earth's atmosphere are displaced in position in unison with variations in intensity of sunspot maxima, and that the annual sunspot numbers may be resolved into a number of regular periods of constant length and amplitude which, when combined, make the regular sunspot period and permit forecasting, with reasonable accuracy, the dates of maxima and minima of sunspots and the intensity of the maxima.

Variability in solar radiation [trans. title], F. Steinhauser (*Met. Ztschr. [Braunschweig], 55 (1938), No. 12, pp. 442–448, fig. 1*).—The author investigated the irregular changes in radiation intensity such as occur in the monthly or yearly average radiation values observed over long periods of time, and such as are due to fluctuations in atmospheric penetrability from day to day when deviations of the individual values from the average annual radiation become evident. The scattering of the individual values over the annual curve decreases markedly with the altitude of the point of observations, as shown by the 6-yr. records presented.

Measurements of radiation in bright sunlight [trans. title], F. Sauberer (*Met. Ztschr. [Braunschweig], 55 (1938), No. 12, pp. 435–442, figs. 5*).—In sunlight, measurements of the spatial distribution of light were made in fog and the radiation balance was determined for horizontal and vertical stone surfaces. Furthermore, the radiation balance was compared over different surfaces, principally stone and snow, in fog and in sunny weather. Very high positive radiation balance values were found over dirty ice. On bright days the radiation balances of snow surfaces after midday may exceed those over stone, since the total radiation of stone can increase strongly as a result of the raising of surface temperature. Reflection measurements with and without color filters were made by the use of photoelements.

Investigations of the distribution of light in a beech stand [trans. title], E. Trapp (*Bioklim. Beibl. Met. Ztschr., 5 (1938), No. 4, pp. 153–158, figs. 5*).—The light distribution in a 0.25 ha. beech stand was determined by photoelectric elements. In addition to the usual determinations some cartographic surveys were made under different weather conditions and at different times of day. The average degree of light in the stand fell under complete foliation to ±5 percent that in the open. A map showing the locations of the trees and their crowns (with the areas thinly and thickly foliated) is presented. The vertical light distribution was also investigated.

Utilizing heat from the sun, C. G. Abbot (*Smithsn. Misc. Collect., 98 (1939), No. 5, pp. [1]+11, pls. 4, fig. 1*).—The author discusses the quantity of solar

[1] Contrib. Boyce Thompson Inst., 9 (1938), No. 3, pp. 171–178, fig. 1.

energy available, intermittance and storage of solar power, water distilling and cooking by solar heating, recent commercial products a boon to solar devices, mechanism for following the sun, domestic water heaters, solar cookers, solar water distilling, the solar flash boiler for power, flash-boiler devices, automatic regulation of flow of boiler water, efficiency of solar flash boiler, competition of solar power against coal, oil, and water power, early experiments with solar power (1910), storage of solar heat or power, and the commercial use and cost of solar heating.

Monthly Weather Review, [January–February 1939] (*U. S. Mo. Weather Rev., 67 (1939), Nos. 1, pp. 38, pls. 21, figs. 6; 2, pp. 39–60, pls. 14, figs. 4*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the article noted on page 333 and the following contributions:

No. 1.—A Brief List of Works on Meteorology, compiled by R. T. Zoch (pp. 1–3); Valley-Head Cloud Windows, by R. L. Ives (pp. 11, 12); Duststorms of 1938 in the United States, by R. J. Martin (pp. 12–15); and Weather of 1938 in the United States, by J. P. Kohler (pp. 16, 17).

No. 2.—An Observation of Variable Water-Vapor Content in Rapidly-Moving Air Masses, by A. Adel and C. O. Lampland (p. 39); and Unusual Fluctuations in the Dew-Point Along the Southern California Coast, by D. Blake (pp. 39–41).

Climatological data for the United States by sections, [January–December 1938] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 25 (1938), Nos. 1–12, [about 200 pp., 3 pls., 3 figs. each]*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

[Meteorological records at the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 29 (1938), pp. 12, 13*).—The following tabulated data are included: Rainfall in inches by months and years, 1923–37; dates on which first and last killing frosts occurred and the number of growing days at Tifton, 1923–37; and temperature by months, 1937.

[Meteorological work by the Nebraska Station] (*Nebraska Sta. Cir. 60 (1939), pp. 9–13, figs. 2*).—A historical sketch is given of the achievements of the station with respect to weather records, studies, and publications. A map shows the distribution of average precipitation in Nebraska and a graph illustrates the average rainfall for the State as a whole from 1876 to 1938.

SOILS—FERTILIZERS

[Soil investigations by the Western Washington Experiment Station] (*Western Washington Sta. Rpt. 1938, pp. 39–43*).—This report notes work on soil reaction studies, by K. Baur; on fertilizer placement; adaptability and fertility studies on the Nisqually, Felida, and Lauren series; on fertilizers for freezing peas, by Baur; and on maintenance of organic matter in western Washington soils.

A tool for the rapid sampling of soils, F. L. Davis. (La. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 3, p. 270, fig. 1*).—The sampling tool was made from an 18-in. piece of plumber's brass tubing with a wooden handle fitted into one end. A slot for facilitating the removal of the soil was cut into one side of the tube with a thin emery wheel and a hacksaw blade. The bottom end of the tube can be kept sharpened with a large-size cork borer sharpener or mill file.

[Soil Survey Reports, 1932–35 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1932, No. 33, pp. 48, pls. 2, figs. 2, maps 2; 1933, No. 22, pp. 45, figs. 2, map 1; 1934, No. 14, pp. 56, figs. 3, map 1; 1935, No. 4, pp. 60, figs. 2,* map *1*).—These surveys were made in cooperation with the Alabama Department of Agriculture and Industries and the Texas and Wyoming Experiment Stations. That for 1932, No. 33, covers Sheridan County, Wyo., J. Thorp et al.; 1933, No. 22, Colbert County, Ala., L. G. Brackeen and A. L. Gray; 1934, No. 14, Hunt County, Tex., E. H. Templin and R. M. Marshall; and 1935, No. 4, Hale County, Ala., M. J. Edwards et al.

Desert subsoil temperatures, W. V. Turnage (*Soil Sci., 47 (1939), No. 3, pp. 195–199, figs. 2*).—The construction, calibration, use, and performance in use of simple copper- and constantan-wire thermocouples for determining soil temperatures are briefly described.

Soil temperatures at 3-, 6-, and 12-ft. depths from March 1937 to May 1938 at Tucson, Ariz., are shown, together with comparative thermometer and thermocouple records at the 6-ft. depth for the same period. The minimum temperature periods at the three depths occurred just before and during the spring growing season when leaf and stem growth of plants was rather active. The maximum temperature periods came during the summer rainy season when stem growth was at a maximum. At these depths the temperature at no time fell below the minimum for root growth of desert plants. Neither did the temperature rise as high as the optimum for root growth of certain desert plants having known optima. The range of temperature from the summer of 1937 until the summer of 1938 at 3 ft. was 25° F., at 6 ft. 15°, and at 12 ft. only 7°.

Nebraska soils and their management (*Nebraska Sta. Cir. 60 (1939), pp. 14–21, figs. 4*).—This article presents a brief popular historical summary of the soil work of the station since 1887.

The forest floor of the chaparral in San Gabriel Mountains, Calif., J. Kittredge, Jr. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 7, pp. 521–535, fig. 1*).—The author studied the amount of the forest floor material and its water relations in the Fern and Bell Canyons in southern California. The Fern Canyon showed an average of 15 metric tons of forest floor material per acre, almost three times the average quantity found in the Bell Canyon.

"The mean volume weights for individual types vary from less than 0.1 to 0.36. In Fern Canyon there is a well-defined differentiation between the types or group with high means in which manzanita, chamiso, or bigcone-spruce . . . predominate and those with low means in which the oaks predominate.

"Field moisture capacities vary less within types than the other measures. Three groups within each canyon show a significant difference in the means, although the difference between 157 percent in one canyon and 150 percent in the other is not significant. In general, the manzanita, *Ceanothus*, and chamiso are associated with low field moisture capacities of the floor and oak and bigcone-spruce with high.

"The depth of water retained by the forest floor represents an integration of amount, volume weight, and field moisture capacity of the materials, and gives an indication of the role of the forest floor in intercepting rainfall. Like its component elements, it varies within types to such an extent that the small differences between the means of types are rarely significant. The groups of types, however, are distinct, a low group in Bell Canyon retaining 0.06 in., a high group 0.12 in.; and in Fern Canyon, a low group, 0.19, and a high group, 0.28 in. These amounts, less the actual moisture content at the beginning of rain, would be held subject to evaporation from the forest floor and would not contribute to soil moisture or to surface run-off."

The annual accumulation and creep of litter and other surface materials in the chaparral of the San Gabriel Mountains, Calif., J. KITTREDGE, JR. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 7, pp. 537–541*).—The average annual accumulation of organic material in the chaparral communities of diverse composition, age, and location rarely varied beyond the amounts of from 0.2 to 1.4 metric tons per acre, with a general average of 0.6. The ratio of total forest floor to the annual accumulation increased with age of the vegetation from about 8 in the 18-year-old chaparral of Bell Canyon to over 26 in the more than 50-year-old types of Fern Canyon. Leaf material constituted from 37 to 67 percent of the annual accumulation and amounted to about 0.25 metric ton per acre on an average. Two exceptions, with percentages of 0.7 and 5.6, may be mentioned for types to which chamiso gave character. Sufficient creep of loose surface material took place annually to override a 2-in. barrier on 18 percent of the area of Fern Canyon and on 16 percent of the area of Bell Canyon.

Some moisture relationships of soils from burned and unburned longleaf pine forests, F. HEYWARD (*Soil Sci.*, *47* (*1939*), *No. 4, pp. 313–327, pls. 2, fig. 1*).—Field moisture percentage was determined throughout the year in four paired burned and unburned areas. Normal moisture capacity and wilting percentage were also determined in undisturbed soil columns, together with the water-holding capacity of sifted soil.

All determinations of field moisture percentage being grouped, for the 0- to 2-in. depth in 26 of 28 determinations the soil from the unburned timber stands was more moist, 12 of these differences being statistically significant; for the 4- to 6-in. depth, soils from unburned stands were more moist in 20 of 28 determinations, of which 11 were significant; and for the 8- to 10-in. depth, soils from unburned stands were more moist in 22 of 28 determinations, of which 11 were significant. The differences in percentage were small as absolute values, but in relative values soils from the unburned areas were as much as 52 percent more moist for the 0- to 2-in. depth than for the corresponding soil depth on burned areas. Differences between moisture retention as measured by wilting percentage and normal moisture capacity obtained for undisturbed soil columns from the 0- to 3-in. depth were neither large nor consistent. The soils protected from fire showed a slightly higher retention of water as determined for sifted soil from the 0- to 3-in. depth. Since the differences in water retention were not sufficiently large to explain the differences found between field moisture percentages, it is concluded that the differences in field moisture were caused by some factor other than the nature of the soil itself.

Some changes in the soil during natural succession of vegetation after abandonment in western Nebraska, B. I. JUDD and M. D. WELDON. (Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 3, pp. 217–228, figs. 4*).—The authors studied cultivated land, native grassland, and land abandoned for various periods of time in Kimball County, Nebr., to ascertain the changes occurring in the soil during revegetation.

The rate of infiltration of water in the field was considerably greater under wheat stubble than under native vegetation. It was relatively low after 1 yr. of abandonment, but after several years became approximately equal to that of the wheat stubble land. Bare areas in the abandoned land generally had a low infiltration rate. The rate of percolation of water through a 6-in. column of topsoil showed about the same relationships as the infiltration rate. Percolation in the soil from the native grassland and the bare areas of the abandoned land was much slower than in that from the stubble field and the abandoned areas under vegetative cover.

The volume weight and the state of aggregation of the soils were very closely correlated. The volume weight and the percentage of large aggregates (larger than 0.5 mm.) were highest in the soils having the lowest infiltration and percolation rates, and were generally lowest in the soils permitting the fastest infiltration and percolation.

The organic matter and nitrogen content of the soil of cultivated and abandoned fields tended to be lower than in the native grasslands, but the difference was not statistically significant for the number of samples taken. Under the native grasses 7.3 percent of the soil organic matter in the surface 6 in. and 2.2 percent of that in the second 6 in. was found to consist of plant roots. Under cultivation or abandonment, the percentage of root material was much smaller. The root content of the soil of the cultivated fields, determined shortly after wheat harvest, was found to be from one-fourth to one-third of that under native grassland vegetation. After several years of abandonment, the root content of the soil was greater than in cultivated fields and was approximately half of that under native grasses.

The effect of 1936 flood deposits on Vermont farm lands, D. E. DUNKLEE and A. R. MIDGLEY (*Vermont Sta. Bul. 445 (1939), pp. 16, pls. 8*).—This bulletin reports briefly upon a survey of the extent and nature of the 1936 flood damage and describes the reclamation measures found most effective.

Rivers carrying from 7 to 19 in. of rainfall left deposits consisting mostly of silt and sand on more than 4,000 acres while more than 300 acres of cropland were washed downstream. Deposits were from 1 in. to 6 ft. deep, more than one-third of them being too deep to be plowed under.

Most of the deposits lacked plant food, except lime, and certain acid deposits lacked lime also. Manure (10–20 tons per acre) or complete commercial fertilizer (200–400 lb. per acre, double strength) produced good crops, whereas those on unfertilized areas were stunted. Small subsequent annual applications were found to be preferable to those made once in a rotation.

Early spring seeding, especially of legumes, was found vitally necessary. Surface sowing before machinery could be used worked well with sweetclover. Sweetclover produces a large tonnage, improves soil condition, and seed is cheap. Reed canary grass is suggested for use on sedge and cattail swales. Bromegrass was the best sod-forming, deposit-resisting crop on dry silts. A mixture of oats, red and alsike clovers, alfalfa, timothy, and bromegrass did well on shallow neutral deposits. Corn, rye, buckwheat, barley, and oats succeeded on deep acid deposits when heavily manured. Shallow acid deposits, when plowed under, could be planted to the same crop that formerly succeeded.

"Ordinary seeding practice is apt to be inapplicable under these unusual conditions. To check blowing sand is more important than to increase its fertility; hence deposits should be plowed if the old soil can be reached, since harrowing encourages sand blowing. Fall plowing is obviously inadvisable on river bottoms. The use of a corrugated roller tends to check driven sand. Quackgrass and weeds keep sand from blowing from unreclaimed areas onto adjacent lands. Planting willows along river banks tends to inhibit further loss of cropland."

Principles of gully erosion in the Piedmont of South Carolina, H. A. IRELAND, C. F. S. SHARPE, and D. H. EARGLE. (Coop. S. C. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 633 (1939), pp. 143, figs. 96*).—This bulletin covers a general study of conditions which make the southern Piedmont particularly susceptible to gullying, and an investigation of the causes, mechanics, and rate of gully cutting in 12 representative gullies, largely untreated, in South Carolina, together with less detailed study of a much larger number. The authors find

4 distinct stages in the development of the deep caving gully characteristic o the southern Piedmont. "*In stage 1, the channel-cutting stage, the gully work downward through the A and B horizons. Cutting in this stage is relatively slow, and this is the time at which protective measures can best be undertaken.* Stage 2 begins when the gully penetrates the base of the B horizon and begins cutting in the weak parent material. This stage, characterized by the headward migration of an overfall and plunge pool and by rapid caving of the walls and deepening of the channel, is much the most violent stage of gully growth and is the least favorable for the successful application of control measures. Caving and slumping of the walls and heads alternate with periodic clearing out of the caved material from the gully channel. Additional substages in the gully's growth may occur in the form of periods of headward progression of successive waterfalls or knickpoints, marking renewed channel cutting and deepening of the gully. Stage 2 ends when erosion is retarded because the channel reaches a graded condition under the control of some local base level. Stage 3 is a period of adjustment to the graded channel. Slopes of the gully walls are reduced by weathering, slope-wash, and mass movement; plants are able to get a foothold on the lowered slopes, and vegetation gradually brings about a healing of the gully. Stage 4 is a period of stabilization and is characterized by the slow development and accumulation of new topsoil over the old scarred surface. Rejuvenated cutting brought about by lowering of the base level or an increase in the amount or rate of run-off can at any time cause stage 3 or 4 to revert to stage 2."

Major climatic factors in gully erosion in the Spartanburg area are the intense cold-front rains and tropical hurricanes of late summer and early fall. Deep weathering of the igneous and metamorphic rocks of the Piedmont prepares the way for rapid erosion. Past and present land use, and periods of land abandonment, in particular, have been causes of sheet erosion and gullying.

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Strip cropping in southwestern Pennsylvania, D. H. WALTER. (Coop. U. S. D. A.). (*Pennsylvania Sta., Jour. Ser. Paper 783 (1937), pp. 12*).—This report is based upon 19 farms where strip cropping has been practiced for from 5 to 20 yr. Of these, 16 had all rotation land strip cropped. Strip cropping was started by 16 of the 19 farmers primarily to control erosion. Nine farmers claimed they started the practice without any outside knowledge or influence, 5 had the idea from neighbors, and 3 from reading. Slope was thought by the operators to be the most important factor in determining whether a field should be strip cropped, and degree of slope and convenience in size of fields were the two important factors determining width of strips. The average width of 96 strips on the farms surveyed was 139 ft., and the average slope 16.4 percent. These strips were found to average 4 percent off contour. Only 1 farmer used any type of instrument to lay out strips. There was a tendency to have less clean tilled crops on the steeper slopes.

In general, the operators thought less power and time were required in working fields under their system of strip cropping. Yields were estimated by operators to be higher now than 10 or 15 yr. ago, primarily because of lime, manure, and erosion control. Gully control was reported by the farm operators to be the most important accomplishment of strip cropping. Sod waterways were found on 9 farms, but were fully adequate to control erosion on only 3.

Base exchange in soils.—I, A critical examination of the methods of finding base-exchange capacity of soils, A. N. Puri and H. L. Uppal (*Soil Sci., 47 (1939), No. 3, pp. 245–253, fig. 1*).—From the results of a critical review of methods of finding the base-exchange capacity of soils, the authors conclude that different methods refer to different points on the titration curves of soils and, as such, are arbitrary and empirical. The only satisfactory method of defining the base-exchange properties of soils is through their titration curves, the determination of which is as easy as is the finding of base-exchange capacity by any of the well-known methods.

The determination of redox potentials of soils, N. J. Volk. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 344–351*).—All chemical preservatives tested, when they effectively inhibited bacterial action in soils, also altered the Eh of the soil to such an extent that the results were no longer comparable. Cooling the soils to just above the freezing point was found to be a very effective preservative method, however.

Oxidation of reduced compounds in the soil was prevented by the use of water saturated with nitrogen and by performing analytical operations in an atmosphere of nitrogen. The Eh–pH relationship, even within close range of the initial pH, was found to vary from 58 to 101 mv. for different soils. The Eh–pH relationship was, therefore, determined for each soil studied and correction in Eh made accordingly for differences in pH. Potential drift was found to be due to previous treatment of the blank electrodes and not to the agar bridge. Smooth straight wire platinum electrodes 2 cm. in length were found superior to foil, since roots clinging to the foil electrode caused misleading results. Details of the analytical procedure finally adopted are given. Results agreeing within 5 mv. by this method are considered satisfactory. Eh values of from 15 to 20 soils per hour can be determined by using a battery of 30 aspirators involving 30 glass electrodes and 120 blank electrodes.

A method for controlling the pH of nutrient solutions in sterile sand cultures, H. A. Wilson and L. A. Richards. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 358–362, figs. 3*).—The authors describe a set-up designed to provide continuous sterile irrigation with buffered nutrient solutions for a study of the influence of pH upon the nitrogen-fixing power of certain rhizobia. The apparatus produced a rate of flow of about 18 l. per pot per day under the operating conditions specified.

Phosphate buffering was satisfactory at pH 7 or above but could not be used at lower values because of the steep slope of the phosphate titration curve below pH 5.4. For the range from pH 4 to 7, buffering with potassium hydrogen phthalate was found more suitable.

Comparative study of the colloids of a Cecil and a Susquehanna soil profile, W. P. Kelley, A. O. Woodford, W. H. Dore, and S. M. Brown. (Univ. Calif.). (*Soil Sci., 47 (1939), No. 3, pp. 175–193, figs. 4*).—On the basis of chemical composition, dehydration investigations, optical properties, and X-ray analysis, it was concluded that the colloidal material of the Cecil profile has essentially the same composition throughout the profile and consists primarily of halloysite or kaolinite. Even the granite-gneiss, only slightly altered, found at a depth of 24 ft. shows the presence of kaolinitic clay. This was taken to indicate that under the climatic conditions of Alabama, a kaolinitic type of clay is formed at a comparatively early stage in the weathering of granite-gneiss.

The colloid of the Susquehanna profile is predominantly kaolinitic in the A and B horizons and beidellitic or montmorillonitic in the deeper horizons. The almost white layer found at about 11 ft. in depth is primarily montmorillonite.

Mineralizable nitrogen in some Hawaiian soils, E. T. FUKUNAGA and L. A. DEAN. (Hawaii Expt. Sta.). (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *43* (*1939*), *No. 1, pp. 17–22, figs. 2*).—The moisture equivalent was shown to be a satisfactory moisture content at which to maintain soils when they are incubated for the purpose of determining mineralizable nitrogen. There appear to be two phases of nitrogen release when soils are incubated—an initial rapid phase (from 3 to 4 weeks), followed by a phase of slow release. The initial phase appears to be associated with the microbiological decomposition of predominantly nitrogenous compounds. A very significant relationship was found between the mineralizable nitrogen and the uptake of nitrogen by *Panicum* grass (*P. purpurascens*) grown in pots.

Is sunlight a factor in nitrogen transformation in soil? B. N. SINGH and K. M. NAIR (*Soil Sci.*, *47* (*1939*), *No. 4, pp. 285–291*).—Various nitrogenous substances were tested in exposed and covered sterilized and unsterilized substrates. The experimental technic concerned in the protection of treatments from light was designed to avoid large thermal variations generally resulting from the blackening of the surfaces of containers.

"The accumulation of nitrite was due to both photochemical and biological reactions. The oxidation of nitrite to nitrate was exclusively due to biological agency. The conclusion reached is that biological reactions are largely responsible for the processes of ammonification and nitrification in soil, though nitrite is formed also as a result of photochemical action."

The influence of cropping on the nitrogen-fixing powers of soil, J. E. GREAVES and A. F. BRACKEN. (Utah Expt. Sta.). (*Soil Sci. 47* (*1939*), *No. 3, pp. 201–206*).—When soils from wheatland and adjacent virgin land from Juab County were inoculated into a synthetic medium, the gains in nitrogen from the cropped soils were greater than those from the virgin soils in all 3-ft. sections used; in Cache County, fixation was greater in the cropped first foot but reversed in the second foot. The nitrogen gains made by the Cache County soils were considerably greater than those of Juab soils. "This is probably due to two factors; namely, the Cache soils contain a larger quantity of carbonaceous materials than the Juab soils; almost all of the Cache soils carry a rich *Azotobacter* flora, whereas these organisms are generally absent in the Juab soils."

When alfalfa soil was inoculated into the same medium, the fixation was about twice that observed when virgin or wheatland soil was used. The increase was observed in the first-, second-, and third-foot sections of the soil "and is the result of either a direct or an indirect action of the legume upon the nonsymbiotic nitrogen fixers." The addition of ground alfalfa, ground pea vines, and ground straw to Nephi dry-farm soil increased the nitrogen-fixing power during the first 2 yr. to approximately the same extent. The influence of the treatment with alfalfa persisted longer, however, than did the influence of the pea vines or straw. All the plant residues caused greater increases in the nitrogen in the soil than could be accounted for by the added nitrogen. The greatest gains in soil nitrogen were caused by the addition of alfalfa. Some of the added carbonaceous material still remained in the soil after 11 yr.

Thermophilic decomposition of plant residues in composts by pure and mixed cultures of microorganisms, S. A. WAKSMAN and T. C. CORDON. (N. J. Expt. Stas.). (*Soil Sci.*, *47* (*1939*), *No. 3, pp. 217–225, pl. 1*).—Mixtures of 80 percent straw and 20 percent alfalfa were found to give composts without requiring the addition of any mineral salts. Cereal straw supplemented with mineral salts and with calcium carbonate gave an excellent compost in from 21 to 35 days when kept at about 50° C. The presence of $CaCO_3$ was essential

for the rapid decomposition of plant materials as a whole, and especially of cellulose by the active thermophilic fungi.

A thermophilic population obtained from an active compost brought about greater decomposition at higher temperatures than did a mesophilic population obtained from soil. No single pure culture could give as extensive and as rapid decomposition as the total population of a thermophilic compost. Among the thermophilic organisms active in the decomposition of plant materials in composts, certain fungi and actinomycetes were found highly significant. One thermophilic fungus was found to compare favorably with the total thermophilic population.

Excellent growth of the edible mushroom *Psalliota campestris* was obtained on composts of plant residues. This organism was found to derive its nutrients primarily from the lignin and its transformation products and from the proteins in the compost.

The effect of degree of base saturation of soils upon the fixation of phosphate and potassium and the availability of phosphorus, G. M. Gilligan (*Delaware Sta. Bul. 215 (1938), pp. 20, figs. 8*).—Three soils (one highly organic) were deprived of their exchangeable bases by electrodialysis, and series of these soils with increasing calcium saturation were prepared for the purpose of determining the effect of degree of Ca saturation upon the sorption of phosphorus and potassium.

Phosphate sorption was influenced by both degree of calcium saturation and pH. Appreciable fixation took place in the hydrogen soils. This type of sorption is attributed to the formation of difficultly soluble Fe and Al phosphates. A decrease in sorption in the lower Ca soils and slightly acid range was observed with one organic and one inorganic soil. Sorption in the Ca soils is looked upon as a function of the exchange complex and pH and influenced by the nature of the exchangeable ions involved. At high Ca levels (in the presence of high Ca-ion concentrations, high pH, and $CaCO_3$) the high sorption values observed are attributed in large part to the precipitation of insoluble calcium phosphate. The mechanism of phosphate sorption by the organic soil is considered to be less complicated than that taking place in inorganic soils. The sorption curve resembles the precipitation curve obtained when a mixture of an organic acid in a H_3PO_4 is tritrated with $Ca(OH)_2$.

Sorption of potassium in a nonexchangeable form increased with increasing degree of Ca saturation in the inorganic soils. The organic soil failed to fix potassium in a nonexchangeable form.

"The results indicate that from a practical standpoint it is advisable to maintain the soils investigated at a calcium level sufficiently high to avoid the formation of insoluble Fe and Al phosphates yet somewhat below complete saturation where insoluble calcium phosphate is precipitated. Demobilization of potassium would be anticipated as a result of overliming."

Decomposition of dolomitic limestone in soils when used as a neutralizing agent in complete fertilizers: Studies on Dunbar very fine sandy loam, Ruston sandy loam, Norfolk fine sandy loam, and Portsmouth fine sandy loam, E. R. Collins and F. R. Speer (N. C. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 1, pp. 142–147, fig. 1*).—The purpose of this study was to determine the rate of decomposition of the dolomitic limestone as evaluated by reaction change in the soil and by the determination of residual carbonates after a crop of cotton had been grown on it for from 65 to 75 days. Magnesium determinations were made on a few plant samples to indicate any change in the concentration of magnesium in the plant due to the decomposition of the dolomitic limestone during the growing season.

Neutralization curves for the humic acids of peat soils, B. D. WILSON and E. V. STAKER (*[New York] Cornell Sta. Mem. 219 (1939), pp. 19, figs. 6*).—Humic acids variously extracted from peat soils were titrated by means of a glass electrode and barium hydroxide, the nature of the acidity being indicated by neutralization curves.

The neutralization curves were found to resemble those characteristic of weak acids. Some of the humic acids showed a break in the curves, others not. Whether or not a break appeared seemed to depend more on the method employed in preparing the humic acids than on the organic material used in making the extract. "The absence of more than one break in the neutralization curves for acids which are generally considered to be polybasic may have been occasioned by the presence of mixed groups of acids, the dissociation constants of a particular acid or group of acids being indistinguishable because of the reaction effects of other acids." The character of the neutralization curves is shown to be closely related to the cation-exchange capacity and to the initial reaction of the humic acids.

The availability, to crop plants, of different forms of selenium in the soil, O. E. OLESON and A. L. MOXON. (S. Dak. Expt. Sta.). (*Soil Sci., 47 (1939), No. 4, pp. 305–311, figs. 2*).—The authors analyze six soils from seleniferous farms for various important constituents, including total and water-soluble sulfur and total, water-soluble, acid-soluble, and organic selenium. Ten plantings were made on the soils in the greenhouse, and the plants were analyzed for selenium to determine the availability of the selenium in the six soils to various plants. The availability of the selenium in soils appears to be dependent upon the amount of water-soluble selenium, which in turn seems to be correlated with the amount of organic selenium in the soil. The total sulfur content and the water-soluble content of a soil appear to be of little or no significance in determining the availability of selenium to plants in a naturally seleniferous soil.

The selenium cycle and the forms of selenium in soils are discussed briefly.

Toxicity studies with arsenic in eighty California soils, A. S. CRAFTS and R. S. ROSENFELS. (Coop. U. S. D. A.). (*Hilgardia [California Sta.], 12 (1939), No. 3, pp. 177–200, figs. 3*).—Arsenic toxicity in soils was correlated with texture, being greatest in sandy soils and least in soils of high clay content. All red soils rendered much of the arsenic unavailable, however.

Arsenic sterilization on coarse, gritty soils in California requires a dosage of 2 lb. As_2O_3 per square rod. Loams, silt loams, and those clay loams developed directly from acid igneous rocks or highly weathered require from 4 to 6 lb. per square rod. Clays and adobe clays and some clay loams demand applications of from 8 to 12 lb. per square rod. Red soils or recent alluvial soils from sedimentary rocks require approximately twice as much arsenic for a given type.

It was shown that light annual applications of soluble arsenic or use of dry arsenic trioxide with the addition of about 10 percent sodium chlorate may be less wasteful on soils that render much arsenic unavailable. Heavy leaching tends to reduce the concentration of available arsenic in the soil.

Arsenic fixation in relation to the sterilization of soils with sodium arsenite, R. S. ROSENFELS and A. S. CRAFTS. (Coop. U. S. D. A.). (*Hilgardia [California Sta.], 12 (1939), No. 3, pp. 201–229, figs. 6*).—In addition to further observations similar to those noted from the preceding paper, the authors found that decreasing the moisture content of a soil below field capacity has no effect upon toxicity. This is attributed to the fact that, within the range of sublethal applications, the concentration of arsenic remains about the same

in some soils and in others decreases. Moisture content at field capacity is not an important factor in arsenic toxicity.

Curves of concentration, *C*, against application, *A*, may be constructed from two experimental determinations of concentration by the use of the equation $\log C = -1.5 \log (F-x) + \log K$, in which *C* equals parts per million of soluble As_2O_3, *x* equals milligram of As_2O_3 fixed by 1 kg. dry soil, and *F* and *K* are constants. "Curves relating the percentage yield in the greenhouse tests to the concentration of soluble arsenic, plotted from the curves of *C* against *A*, were much more alike than the standard toxicity curves relating percentage yield to application of arsenic on the basis of dry soil—a fact suggesting that arsenic toxicity can be largely explained in terms of fixation."

Toxicity studies with sodium chlorate in eighty California soils, A. S. CRAFTS (*Hilgardia [California Sta.], 12 (1939), No. 3, pp. 231–247, figs. 3*).—Repeated cropping of chlorate-treated soils resulted in continued loss of toxicity. Toxicity to the first crop was highest in Stockton adobe clay, second in Fresno sandy loam, third in Columbia fine sandy loam, and lowest in Yolo clay loam. By the seventh crop toxicities had shifted so that Fresno sandy loam stood highest, Columbia fine sandy loam second, Yolo clay loam third, and Stockton adobe clay lowest. Although fertility largely governs the initial toxicity of chlorate in soils, "some other factor controls the change in toxicity with time and cropping." The general relation of toxicity to fertility was confirmed. In nearly every case, soils deviating markedly from the expected results proved to have come from arid regions and consequently to be high in total salts.

Yield tests and land valuation, W. G. MURRAY, A. J. ENGLEHORN, and R. A. GRIFFIN (*Iowa Sta. Res. Bul. 252 (1939), pp. 49–76, figs. 2*).—Corn yields on various areas in Tama and Story Counties were determined, and the degrees of correlation between yield and depth of soil and between yield and slope were studied. In both counties the correlation with depth was significant for depths of 8 in. or less. Slope was less significant as directly considered, but slope and depth showed a negative correlation. Yields of oats as well as of corn were used in some of the work.

The adaptability of rapid chemical tests for use in determining the nutrient needs of South Carolina soils, F. MOSER. (S. C. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 3, pp. 188–199*).—The author compared the Universal soil testing system developed by Morgan of the Connecticut [New Haven] Experiment Station (E. S. R., 77, p. 302), the Purdue, by Thornton, Conner, and Fraser (E. S. R., 72, p. 303), the Bray test (E. S. R., 62, p. 13), and two commercial testing systems, with reference to their use in determining the requirements of South Carolina soils. All readings of the tests were made comparable by using a 5-cc. aliquot of the soil extract for reading the results of each test in parts per million. Each of the tests was previously standardized by checking against known concentrations of phosphorus and potassium.

"The data show that the Universal, Simplex, and LaMott testing methods may be used for estimating the phosphorus needs of soil, but the Purdue and Bray tests are not very satisfactory for this purpose for South Carolina soils. The results also show that all the methods tested show about the same amount of available potassium on soil having approximately the same milligram equivalent of replaceable potassium. The 1937 yields show that on Orangeburg fine sandy loam a good response for potash fertilizer was obtained on plats where the rapid tests indicated a low availability." The Cecil sandy clay loam gave significant yield increases for potash fertilization, a medium content of available potassium or doubtful response having been indicated by rapid tests; whereas a negative correlation was found between yields and the rapid tests on Cecil sandy loam.

Handbook of fertilizers: Their sources, make-up, effects, and use, A. F. Gustafson (*New York: Orange Judd Pub. Co., 1939, 3. ed., pp. 172, pl. 1, figs. 25*).—This book "is an attempt to supply accurate, up-to-date information as to the source and make-up of commercial fertilizers. Special stress is laid on the effects of fertilizers on soils and crops in the hope of aiding the user in making a wise choice for his individual soil and cropping conditions. . . . Farmers are urged to consider the interrelationship between crops and the effects of the residues from fertilizers used for one crop on those which follow." The chapter headings are: Requirements for plant growth, nitrogenous fertilizer materials, phosphatic fertilizer materials, potash fertilizer materials, effect of fertilizers on crops and soils, factory-mixed fertilizers, home-mixing of fertilizers, purchase and use of fertilizers, liming in relation to fertilizer practice, and organic matter in relation to fertilizer practice and use.

Inspection of agricultural lime products for the season of 1938, H. D. Haskins (*Massachusetts Sta. Control Ser. Bul. 97 (1938), pp. 9*).—This twenty-seventh inspection report gives the composition of the various products which have been sold in Massachusetts during the year. Of the ground limestone products, the mechanical analysis is also given.

AGRICULTURAL BOTANY

Plant physiology in the women's colleges, D. Day (*Plant Physiol., 14 (1939), No. 1, pp. 179–181*).—This is a summary of a report on the teaching of plant physiology, with its implications to agriculture and democracy in America.

Aging in plants, W. Crocker (In *Problems of Ageing: Biological and Medical Aspects*, edited by E. V. Cowdry (*Baltimore: Williams & Wilkins Co., 1939, pp. 1–31, figs. 5*).—This is a critical summary of present knowledge, with nearly three pages of references.

Estimation of protoplasmic permeability from plasmolytic tests, G. W. Scarth (*Plant Physiol., 14 (1939), No. 1, pp. 129–143*).—"This paper includes a discussion of the principles of estimating protoplasmic permeability plasmolytically, the derivation of comprehensive formulas for use in estimating the protoplasmic permeability of cylindrical and spherical cells, and some notes on technic."

Time and temperature of protoplasmic coagulation, H. T. and R. T. Northen. (Univ. Wyo.). (*Plant Physiol., 14 (1939), No. 1, pp. 175, 176*).—At 43.5° C. and above a decided increase in protoplasmic consistency was induced—interpreted as coagulation—in cells of corn, oat, rye, and wheat coleoptiles, and in *Spirogyra* and *Zygnema* a lower temperature effected a decided increase in protoplasmic firmness. The time element in coagulation at 43.5° and at 47.5° suggested the coleoptile-cell protoplasm of wheat, rye, and oats to be more sensitive to high temperature than that of corn.

The relation between structure and function of the phloem, A. S. Crafts. (Univ. Calif.). (*Amer. Jour. Bot., 26 (1939), No. 3, pp. 172–177, figs. 5*).—Careful microscopical and physiological studies lead to the assumption that a high state of permeability exists in mature sieve tubes. Tests with 58 species from mosses and kelps to the most highly specialized angiosperms suggest that this permeable state may characterize these elements in all plants. The common occurrence of phloem exudation and permeable sieve tubes supports the pressure-flow theory as to the mechanism for translocation of organic solutes in plants.

Observations on the membranes of epidermal cells of the Avena coleoptile, W. K. Farr and W. A. Sisson (*Contrib. Boyce Thompson Inst., 10 (1939), No. 2, pp. 127–137, figs. 6*).—The microscopic and X-ray diffraction studies re-

ported are concerned with the membranes of these cells at a period during the process of cell enlargement, and are believed to indicate the following: The cellulose component is in the form of microscopically visible ellipsoid particles of native crystalline cellulose arranged in transverse bands. During cell elongation these bands are distributed at increasing intervals along the membrane without altering their orientation with respect to the long axis of the cell. The plastic state of the noncellulosic component of the membrane is maintained during cell elongation. Although it has been supposed previously that the cellulose is in a state of tension, this is now rendered highly improbable because it is present in the form of discontinuous bands. It is shown that during the process of cell elongation, the tension is exerted not only on the cellulose but also on the more plastic noncellulosic, continuous phase of the membrane.

A new type of embryogeny in the conifers, P. L. Cook. (Univ. Ill.). (*Amer. Jour. Bot., 26 (1939), No. 3, pp. 138–143, figs. 13*).—The early embryogeny of *Juniperus communis* is described and illustrated, disclosing a type unique in the Coniferales and, so far as known, approximated elsewhere only in the Gnetales.

The embryogeny of Sequoia sempervirens with a comparison of the Sequoias, J. T. Buchholz. (Univ. Ill.). (*Amer. Jour. Bot., 26 (1939), No. 4, pp. 248–257, figs. 23*).—The described and illustrated features of the gametophytes and embryogeny of *S. sempervirens* are compared with those of *S. gigantea*, *Sciadopitys*, *Athrotaxis*, and other conifers. It is concluded that the two Sequoias belong to different genera.

Flower buds and phylogeny of dicotyledons, A. Gundersen (*Bul. Torrey Bot. Club, 66 (1939), No. 5, pp. 287–295, figs. 7*).—For many characters, such as sympetaly, zygomorphy, and epigyny, the ontogeny of flowers is said to confirm accepted views of phylogeny, but while flowers with parietal placentation are similar in the bud and adult forms, those with axile placentation usually have a beginning of parietal placentation in the bud. Taxonomic relations are suggested.

Relations between tissue organization and vein distribution in dicotyledon leaves, R. B. Wylie (*Amer. Jour. Bot., 26 (1939), No. 4, pp. 219–225, figs. 10*).—An analysis of leaf structures for 3 groups of dicotyledons (22 herbaceous and 24 woody plants from Iowa and 20 Pacific coast woody plants) indicated a significant correlation between mesophyll organization and vein distribution. The results suggested that problems of transfer from cell to cell restrict mesophyll proximity to vascular supply, and that all tissue arrangements furthering or retarding conduction between living cells become factors in vein separation.

The influence of growth substances on the development of wound tissue in orchard trees [trans. title], E. Jakeš and H. Hexnerová (*Gartenbauwissenschaft, 13 (1939), No. 1, pp. 83–93, figs. 3*).—In tests with cherry, plum, apple, and pear trees, the authors treated artificial and natural wounds at the beginning of each experiment with a paste containing "Belvitan" or 1 percent heteroauxin paste. As compared with the untreated controls, the treatment in all cases induced an accelerated wound-tissue regeneration. Callus formation occurred not only at the edges but also in independent centers over the entire wound surface. With treatment of two wounds 2–5 cm. distant from each other on the same branch, the callus was always better on the lower of the two wounds. Of the two pastes used, Belvitan gave better results than heteroauxin (perhaps the concentration of indoleacetic acid was too high). The results are deemed sufficient to warrant recommending the practical application of growth substance preparations for every kind of wound healing on orchard trees.

Auxin distribution in fruits and its significance in fruit development, F. G. GUSTAFSON (*Amer. Jour. Bot., 26 (1939), No. 4, pp. 189–194*).—The growth substance (auxin) content of ovules and developing seeds is believed to be much greater than of other parts of fruits, and it is considered possible that they produce auxin. Auxin other than that added artificially was found in fruits produced by treating the flower with phenylacetic acid. The probable role of auxin in the growth of parthenocarpic and nonparthenocarpic fruits is discussed. Pepper, tomato, agave, cucumber, squash varieties, yucca, and *Pittosporum whipplei* were used in these studies.

The cause of natural parthenocarpy, F. G. GUSTAFSON (*Amer. Jour. Bot., 26 (1939), No. 3, pp. 135–138*).—The auxin content in ovaries of flower buds from varieties of oranges, lemons, and grapes producing fruits parthenogenetically was found to be higher than in ovaries from corresponding varieties not producing fruit in this way.

Evidence for the presence in certain ether extracts of substances partially masking the activity of auxin, R. H. GOODWIN (*Amer. Jour. Bot., 26 (1939), No. 3, pp. 130–135*).—Determinations of the diffusion coefficients of auxin in ether extracts of corn meal and *Vicia faba* shoots failed to agree with the theoretical values for auxin *a* or *b*. The evidence suggested that this discrepancy was due to the presence in the extracts of substances partially masking the biological effects of the auxin on *Avena* coleoptiles. At least some of these substances are said to be ether- and water-soluble, with molecular weights larger than for auxin. Partial purification of auxin extracts may be made by diffusion methods. In determining the activity of unknown extracts, the possible presence of such masking substances should be considered, for if present in appreciable amounts the actual amount of auxin in an extract may be greater than that detected by the *Avena* test.

Leaf-epinasty tests with chemical vapors, F. E. DENNY (*Contrib. Boyce Thompson Inst., 10 (1939), No. 2, pp. 191–195*).—Of 77 volatile chemicals not previously tested for ability to induce epinasty of potato leaves, only ethyl bromide, ethyl iodide, and propyl chloride gave positive results. The epinasty-inducing volatile product from various organs of plants cannot be any of these 3 alkyl halides nor acetonitrile since mixtures of these with air, when passed through a tube immersed in a freezing mixture of CO_2-snow and alcohol, gave negative tests for epinasty, while volatile products from plants were not condensed by the freezing mixture and the uncondensed gas which issued from the tube retained its effectiveness. Tests of the other volatile chemicals shown to cause epinasty (ethylene, propylene, acetylene, butylene, and CO) showed that the only one behaving like the effective volatile constituent from plant tissue in being absorbed by the $Hg(NO_3)_2$ reagent and released again without loss of epinasty-inducing power is ethylene. It is believed that the evidence indicates the effective constituent from plant tissue to be ethylene and not any of the other epinasty-inducing volatile chemicals tested.

Synthesis of β-(2-chloroethyl)-d-glucoside by potato tubers treated with ethylene chlorohydrin, L. P. MILLER (*Contrib. Boyce Thompson Inst., 10 (1939), No. 2, pp. 139–141*).—"The acetylation of preparations of the chlorine-containing β-glucoside formed by potato tubers from absorbed ethylene chlorohydrin yielded β-(2-chloroethyl)-*d*-glucoside tetraacetate. The glucoside formed by the tubers is thus β-(2-chloroethyl)-*d*-glucoside and is identical with the glucoside formed by gladiolus corms treated with ethylene chlorohydrin."

Carbon dioxide storage.—XIII, Relationship of oxygen to carbon dioxide in breaking dormancy of potato tubers, N. C. THORNTON (*Contrib. Boyce

Thompson Inst., *10* (*1939*), *No. 2*, *pp. 201–204*).—In continuation of this series[2] (E. S. R., 80, p. 428), the results obtained are deemed to indicate that elimination of dormancy in freshly harvested tubers by CO_2 treatment is not due to development of a condition of temporary anaerobiosis during treatment. Instead, CO_2 was most effective in breaking dormancy when it acted in the presence of 20 percent or more of O_2, and this treatment was more effective than complete anaerobiosis brought about by N treatment. The optimum concentrations of CO_2 were 10–60 percent in combination with 20–80 percent of O_2, which, with 5–7 days' treatment, caused the emergence of sprouts from 50 percent of one-eye pieces in soil within 17–30 days, as compared to 44–78 days for the controls.

The synthesis and destruction of vitamin B_1 by Phycomyces, J. BONNER and E. R. BUCHMAN (*Natl. Acad. Sci. Proc.*, *25* (*1939*), *No. 4*, *pp. 164–171*).—Vitamin B_1 was found to be synthesized by *P. blakesleeanus* from a mixture of vitamin pyrimidine and vitamin thiazole, and subsequently to be broken down by the mycelium with destruction of thiazole and liberation of free pyrimidine. Presumably, the thiazole portion is attacked only when combined in the form of vitamin. The evidence is believed to indicate that the first step in the in vivo degradation of the thiamin molecule involves an opening of the quarternary thiazole ring adjacent to the 2-position.

Vitamin B_6, a growth substance for excised tomato roots, W. J. ROBBINS and M. B. SCHMIDT (*Natl. Acad. Sci. Proc.*, *25* (*1939*), *No. 1*, *pp. 1–3*).—Studies here reported appear to indicate that the tomato root depends on the top not only for carbohydrate and thiamin (E. S. R., 80, p. 26), but also for vitamin B_6. The parasitic relation of the root to the shoot is thus more complex than hitherto supposed. In indicating the importance of vitamin B_6 for the growth of plants, it is suggested that this growth substance may prove to be as generally significant for living organisms as thiamin.

Further experiments on excised tomato roots, W. J. ROBBINS and M. B. SCHMIDT (*Amer. Jour. Bot.*, *26* (*1939*), *No. 3*, *pp. 149–159*, *figs. 6*).—In these studies (see also above) brown sugar proved to be more beneficial to growth than pure cane sugar in a solution of sugar, minerals, and thiamin, growth decreasing with reduction in the proportion present. Its ash was not responsible for the observed benefit. Crystalline vitamin B_6 was beneficial, but nicotinic acid, nicotamide, and amino acids—added to the solution of pure sugar, minerals, and thiamin—were not. Vitamin B_6 increased the growth when added to solutions of sugar, minerals, and thiamin in which the proportion of brown sugar was reduced. The beneficial effect of the brown sugar is believed to be due largely to its content of this vitamin. Hooks and curls are reported as developing in roots grown in solutions containing vitamin B_6, and these observations are interpreted to indicate the existence of a growth substance necessary for cell elongation in roots. Evidence is presented for an unknown growth substance in samples of maltose.

Growth behavior of one-millimeter excised root tips, G. C. GALLIGAR (*Plant Physiol.*, *14* (*1939*), *No. 1*, *pp. 163–169*, *fig. 1*).—Using a modified Pfeffer formula with dextrose and peptone added, no regularity of growth was found in excised root tips (principally sunflower and dent and sweet corn) with an original length of 1 mm., but the daily elongation rate (first 10 days) was much slower than that of root tips cut at 10 mm. Within the first 10 days sunflower and corn surpassed sweet corn in elongation rate, while cotton and Gradus and Burpee Extra Early peas grew scarcely at all. Corn tended to develop a short root with abundance of laterals, while sweet corn had the

[2] Amer. Jour. Bot., 24 (1937), No. 10, p. 734.

reverse tendency. Vascular tissue proved unnecessary for growth of excised root tips. In sunflower, 1-mm. tips achieved greater growth than 10-mm. tips, and corn root tips were less able to accumulate dry weight when cut at 1 than at 10 mm. There are 13 references.

Translocation of carbohydrates in the sugar beet, O. A. LEONARD. (Iowa Expt. Sta.). (*Plant Physiol., 14 (1939), No. 1, pp. 55–74, figs. 8*).—Fructose was found to increase in the leaf blades with progress of the season, a low level being associated with rapid and a higher level with slow growth and maturity. Fructose, glucose, and sucrose all exhibited marked diurnal variations within the blades, those of the first two together usually being twice those of sucrose. At times dextrin also showed marked diurnal variations in the blades and is an important secondary product of photosynthesis. In mature leaves in darkness the sugars continued to move into the petioles until the blades were depleted, and they evidently move out of the blade mesophyll into the veins in a polar direction. Polarization appears to be a property of the border parenchyma of the blades. In detached leaves in the sun, sugars moved out of the blade mesophyll and accumulated more or less evenly throughout the midribs and petioles. Here, as in darkness, there was no tendency for accumulation in one section of the petiole more than in another. While polarity prevented sugars from the phloem moving back into the blade mesophyll, no such polarity existed between the phloem and parenchyma of the petioles. During daylight sugar passed out of the phloem and accumulated in the surrounding cells, while at night the reverse occurred. Etiolated leaves contained considerably more glucose than fructose, and practically all the sugar present in the leaves is said to have arisen from sucrose. The results of feeding tests through the cut surfaces of petioles indicated that the various sugars are readily transformed into other forms. Fructose was converted into glucose and into dextrin, but there was also some conversion of glucose into fructose, and leaves fed sucrose contained no more sucrose than those fed either glucose or fructose. A bibliography of 22 entries is included.

Transpiration and the absorption of mineral salts, K. E. WRIGHT. (R. I. Expt. Sta.). (*Plant Physiol., 14 (1339), No. 1, pp. 171–174*).—"The effect of transpiration upon the absorption of mineral ions was determined by analyzing culture solutions in which bean plants had been growing under conditions of high and low transpiration. The contributing effects of the metabolism of the plants upon mineral absorption were offset by (1) selecting plants with the same transpiring power when in the same environment; (2) analyzing the residual culture solutions of the same plants under conditions of high and low transpiration; and (3) devising an experimental procedure attempting to make transpiration the only variable. Analytical results indicate that an increase in the rate of transpiration is associated with a corresponding increase in the absorption of certain ions [P, Ca, NO_3, and K considered]." There are 13 references.

Effect of bordeaux mixture and its various elements on transpiration, J. G. HORSFALL and A. L. HARRISON. (N. Y. State Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 6, pp. 423–443, figs. 4*).—The transpiration of bean and tomato plants in the greenhouse was measured daily by autoirrigators, calculated on the basis of leaf area, and expressed as transpiration ratios. High temperatures on the spray dates and the presence of water favored bordeaux transpiration, while high temperature afterwards failed to affect it. Copper insolubilized at ± pH 7 had little effect on, both acid and alkaline materials accelerated, and oil reduced transpiration. A tentative explanation of the results is that the alkalinity of bordeaux saponifies the cuticle and decreases its resistance to water loss. Desiccation of cut shoots may be used to measure the

cuticular effects of sprays. Increasing the spray load accelerated the desiccation of cut plants, but generally decreased the transpiration from potted plants, presumably because more water is saved by stomatal plugging than is lost through the cuticle. Transpiration from potted plants represents the summation of cuticular and stomatal effects. The balance among various factors determines the magnitude of bordeaux transpiration. Where cuticles are thick and hard, as in the field, it is possible that the effect on the cuticle may at times be so slight as to be overbalanced by the factors for reduced water loss. There are 25 literature references.

Influence of light on the length of the conidia in certain species of Fusarium, L. L. Harter. (U. S. D. A.). (*Amer. Jour. Bot., 26 (1939), No. 4, pp. 234–243*).—The effects of sunlight and artificial irradiation on the length of 3-septate conidia were studied for *F. coeruleum*, *F. martii pisi*, and *F. bulbigenum batatas* grown on various media, the conidia being considerably longer in cultures grown in the light. Cultures held in darkness for the first 2 days and then irradiated for the rest of the growth period produced spores about equal in length to those exposed to light from the start. However, if a culture was incubated in darkness for the first 4 days after inoculation, the results were about the same as if it were kept in the dark during the entire incubation period. On the other hand, if the culture was irradiated for the first 4 days and then shifted to darkness, the results were about the same as if it had been grown in the light for the whole period. Sporodochia and pionnotes were more copious in the light, but vegetative growth was most abundant in the dark. The differences in spore length in cultures grown in light and darkness under otherwise identical conditions were much greater than those used for separating certain species. The maximum number of macroconidia occurred in the light, while microconidia predominated in the dark. Cultures incubated in the light usually gave more sporodochia and pionnotes and produced larger and more numerous macroconidia than those grown in the dark.

Statistically significant differences occurred when different individuals measured conidia from the same microscopic preparation. Such variations in measurements among different workers cannot be left out of consideration.

Response of lettuce seedlings to 7600A radiation, *L. H. Flint and C. F. Moreland.* (La. State Univ.). (*Amer. Jour. Bot., 26 (1939), No. 4, pp. 231–233, figs. 2*).—"Radiation at 7,600 a. u. stunted the growth of lettuce seedlings. The effect was not associated with assimilation nor with temperature. Radiation at 6,500 a. u. and at 8,500 a. u. had no stunting effect. Radiation at 7,600 a. u. incited no phototropic response in lettuce seedlings."

Activation of cinnamic acid by ultra-violet light and the physiological activity of its emanations, P. W. Zimmerman and A. E. Hitchcock (*Contrib. Boyce Thompson Inst., 10 (1939), No. 3, pp. 197–200, fig. 1*).—"Commercial cinnamic acid is a relatively inactive compound for inducing curvatures but it can be activated by ultraviolet light. The *cis* form results from irradiation, and is the active form. When applied to plants as water solution or lanolin preparations this compound induces responses similar to other growth substances reported in earlier publications. In addition, the irradiated cinnamic acid induces epinastic responses of plants similar to ethylene gas when the crystals are set under a bell jar with the plants."

Movement of radiophosphorus in bean seedlings, O. Biddulph. (Wash. State Col.). (*Science, 89 (1939), No. 2313, pp. 393, 394*).—Using Red Mexican beans, the preliminary results reported indicate that phosphorus may be absorbed by the apparently uninjured roots of P-deficient plants and transported

at a rate exceeding 10 cm./hr. Movement in the aerial parts apparently depended on the transpiration stream, with "excretion" of P into the xylem only after considerable accumulation in the living cells of the root.

The introduction of agar-agar into bacteriology, A. P. Hitchens and M. C. Leikind (*Jour. Bact., 37 (1939), No. 5, pp. 485–493, fig. 1*).—A historical account (21 references), ascribing this important technical advance to Frau Fannie Hesse.

Growth factors for bacteria.—VII, Nutrient requirements of certain butyl-alcohol-producing bacteria, L. E. McDaniel, D. W. Woolley, and W. H. Peterson. (Wis. Expt. Sta.). (*Jour. Bact., 37 (1939), No. 3, pp. 259–268, figs. 2*).—Continuing this series of studies (E. S. R., 78, p. 766), accessory growth substances for *Clostridium butylicum* and *C. acetobutylicum* were found in liver, yeast, malt sprouts, yellow corn, wheat bran, and a commercial vitamin preparation, and are discussed, with methods.

Role of nitrogen in fungous thermogenesis, J. O. Gaskill and J. C. Gilman. (Iowa Expt. Sta.). (*Plant Physiol., 14 (1939), No. 1, pp. 31–53, figs. 12*).—Asparagine, NH_4Cl, $NH_4H_2PO_4$, $(NH_4)_2SO_4$, and $Ca(NO_3)_2$ each greatly stimulated both thermogenesis and dry weight loss when added to the substrate in cultures of *Aspergillus flavus*, *A. terreus*, and *Penicillium oxalicum*, while with *Rhizopus tritici* all nitrogen forms tested increased thermogenesis markedly except the nitrate, which distinctly inhibited it. Only asparagine increased dry-weight loss of *R. tritici*, all the other compounds exhibiting a depressing influence, with the nitrate most effective in this respect. Asparagine proved most generally suitable to the four fungi, both as to thermogenesis and dry-weight loss. The highest temperature recorded was for the two Aspergilli, each supplied with asparagine, viz, 49.25° C. or over 21° above the controls. The greatest loss in dry weight was 16.95 percent in *A. terreus* plus arparagine as compared with 3.54 percent loss in the minus nitrogen controls. Nitrogen additions of 0.01–0.1 gm. per 100 gm. of dry cob meal generally resulted in progressive increases in thermogenesis for *A. flavus*, while greater additions (0.2–1.6 gm.) usually gave results similar to those for the 0.1–gm. addition. Progressive increases in dry-weight loss in *A. flavus* followed the larger additions of asparagine, $NH_4H_2PO_4$, and $Ca(NO_3)_2$, respectively, up to 1.2 and 1.6 gm. N per 100 gm. of dry cob meal. The other three fungi differed considerably in response to varying amounts of these compounds. There are 18 references.

The heavy metal nutrition of fungi, J. W. Foster. (N. J. Expt. Stas.). (*Bot. Rev., 5 (1939), No. 4, pp. 207–239*).—Discussing the subject matter of this review (152 references) under the concept of chemical stimulation and the influence of specific elements (Zn, Fe, Mn, Cu, etc.) in the nutrition of fungi, it is concluded that there can be no doubt that the need for trace amounts of various heavy metals is a phenomenon widespread among fungi. This appears especially true for the filamentous fungi, for which these elements must be considered indispensable. These fungi are considered ideally suited for trace element investigations because of their ease of cultivation and the large amounts of cell substance synthesized. The importance of an appreciation of the extreme sensitivity of fungi to traces of heavy metals, the fragmentary state of our knowledge, and the practical obscurity of the mechanism of action of metals are points that are stressed.

Experimental methods for the study of the role of copper, manganese, and zinc in the nutrition of higher plants, P. R. Stout and D. I. Arnon. (Univ. Calif.). (*Amer. Jour. Bot., 26 (1939), No. 3, pp. 144–149*).—The described water-culture technic adapted to laboratory and greenhouse facilities for studying the physiological importance of microelements involves the selec-

tion of suitable containers, purification of water by redistillation (with Pyrex condenser), and purification of molar stock solutions of the individual nutrient salts. Adaptations of Steinberg's $CaCO_3$ procedure for purifying the solution as a whole were devised for use with the stock solutions. The purity of the water and of each stock solution is tested prior to the experiment by a specially adapted dithizone test. With Pyrex containers and tested water and salts, media of reproducible purity were prepared at all times. Biological confirmation of the purity of nutrient media was obtained by growing plants in solutions deficient in Mn, Zn, and Cu, respectively. Plants consistently developed early deficiency symptoms characteristic of each of these elements.

Experiments on the action of copper on leaves [trans. title], H. DAXER (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 49 (1939), No. 4, pp. 225–251, figs. 16*).—Using a method of immersing individual leaves of pome, stone, and small fruit sorts in receptacles containing $CuSO_4$ solutions of varying concentration for different periods of time, the author studied their copper absorption and its effects. Preliminary tests indicated the great influence of temperature and previous leaf injuries on Cu-burning of the leaves. Experiments with unlimited immersion time indicated that 0.26–0.031 percent $CuSO_4$ solutions, besides killing the treated leaves, caused severe injuries by conduction, which are described. Grapes proved most resistant to such injuries, and stone fruits most susceptible, while the pome fruits lay between. Even a 0.003–0.00125 percent solution was still capable of injury, and the first dilution to induce no injury was a 0.00025 percent solution. Tests of varying duration of immersion indicated that the stronger solutions for a short time caused no appreciable injury, a 0.5 percent solution first causing leaf burn at 1–2 hr. immersion. Longer periods of wetting with very weak solutions also caused burning. The duration of immersion thus exerts at least as great an influence on burning as variations in the soluble Cu content of the mixture. It is deemed probable that in regions with frequent dews or fogs, mixtures containing 0.003 percent dissolved Cu may still cause burning. Tests with a leaf-petiole absorption method indicated that 0.13–0.64 mg. Cu taken up by the petiole can cause very severe "conduction" injuries, while 0.05–0.1 mg. caused in pome fruits only slight, but in stone fruits often medium to strong, injuries. In prome fruits 0.025 mg. Cu caused practically no injury, but on stone fruits slight conduction injury could still be noted. The action of Cu is said to depend not only on the amount but also on its concentration, and the varying tolerance of pome and stone fruits to depend on the differing cellular susceptibility to this element.

Antagonism of certain elements essential to plants toward chemically related toxic elements, A. M. HURD-KARRER. (U. S. D. A.). (*Plant Physiol., 14 (1939), No. 1, pp. 9–29, figs. 5*).—"Arsenic injury is a function of the available phosphate concentration, with the protective arsenic: phosphorus ratio in nutrient solutions near 1:5. Rubidium injury is a function of the available potassium concentration, with the protective rubidium: potassium ratio in nutrient solutions near 1:2. Strontium injury is a function of the available calcium concentration, with the protective strontium: calcium ratio in nutrient solutions near 1:1. As a working hypothesis to explain these effects, the assumption is made that they are the result of some degree of unselectivity in absorption and utilization of chemically related elements, with the result that when an organic molecule is synthesized the chance of harmful substitution of the toxic element for the essential nutrient depends on the proportionate availability of the two. If the assumption proves to be correct, this particular type of antagonism may appropriately be designated 'mass antagonism.'" A bibliography of 39 references is included.

Factors influencing susceptibility of plants to sulphur dioxide injury, I, C. Setterstrom and P. W. Zimmerman (*Contrib. Boyce Thompson Inst., 10 (1939), No. 2, pp. 155–181, fig. 1*).—The present paper attempts to provide some basis for evaluating the accumulated data on the subject and to afford a broader view of the mechanism of SO_2 injury. The new data have been obtained from factorial experiments designed to study a number of variables simultaneously and all have been subjected to analysis of variance. Based largely on the new work, but also in part on previous literature (30 references), the effects of the specific environal factors may be thus summarized: A plant is much more resistant to SO_2 at 40° F. and below than at higher temperatures, but there is no considerable variation in susceptibility above 40°, at least at 65°–105°. In general, resistance decreases with increase in relative humidity. Minor variations (at time of exposure) in soil moisture within the range adequate for growth are without effect on susceptibility, but with approach to the wilting point there is a marked increase in resistance. Plants grown under ample water supply are much more susceptible to injury than those without it. Plants grown in poor soil are more susceptible than those grown in good soil. The sulfate S content of the nutrient supply has no effect on susceptibility and pretreatment with SO_2 has no effect on susceptibility provided time is allowed for recovery between treatments. Plants grown under heavy shade are more susceptible than those grown without shade, but reduction of light intensity up to 35 percent has no effect. Young plants are much more resistant than are older ones, but middle-aged leaves are the most susceptible. Wetting of leaf surfaces has little or no effect.

It is deemed evident that many factors influence the susceptibility to SO_2 injury, and that caution must be exercised in applying experimental results to field conditions. It is believed that the so-called physiological factors (to be reported upon later) will shed more light on the mechanism of SO_2 injury, and that eventually susceptibility to SO_2 injury may be used as an indicator of certain physiological processes.

The use of indicator plants in locating seleniferous areas in western United States.—I, General, O. A. Beath, C. S. Gilbert, and H. F. Eppson. (Wyo. Expt. Sta.). (*Amer. Jour. Bot., 26 (1939), No. 4, pp. 257–269, figs. 14*).—Continuing this line of investigation (E. S. R., 77, p. 600), the authors treat of the geographical and geological occurrences of 32 species of native selenium indicator plants, one or more of which occur in 12 western States. These indicators are defined as plants which contain significant amounts of Se during all or a major part of their annual growth and thrive only in its presence. A number of intermediate Se-bearing plants are also included which may contain it when rooted in Se-bearing rocks and soils but which are not restricted to such occurrences. The data presented are believed to warrant the following: "Selenium is not a constituent of all rocks; the amount of selenium absorbed by a given species varies greatly at different horizons within a given formation; the areas containing seleniferous plants in which the selenium is present in toxic amounts are limited; a very significant percentage of the vegetation growing on seleniferous soils does not absorb selenium in toxic amounts; seldom are indicator plants formed above an elevation of 8,500 ft.; all species of *Stanleya*, *Oonopsis*, and *Xylorrhiza* thus far studied are classed as indicator plants; only those species of *Astragalus* which occur in 5 of the 29 groups as clasified by Jones[3] are seleniferous; the characteristic odor given

[3] Revision of North American species of *Astragalus*, M. E. Jones. Salt Lake City, Utah, [1923], pp. 288+[42], [pls.] 78.

off by some seleniferous Astragali is evidence that selenium is present. The origin, form, and distribution of selenium in soils is considered."

The taxonomy and ecology of Agropyron spicatum and A. inerme, R. F. DAUBENMIRE. (Univ. Idaho). (*Bul. Torrey Bot. Club, 66 (1939), No. 5, pp. 327–329*).—Because of the complete intergradation of the awn character (the sole basis of distinguishing the two so-called species) and because of the identical and unusual response to environal variation, the author recommends that a single species name, *A. spicatum*, be applied to the entire group, with broadened description as given.

The morphology and phylogenetic position of the genus Jouvea (Gramineae), P. WEATHERWAX (*Bul. Torrey Bot. Club, 66 (1939), No. 5, pp. 315–325, figs. 11*).—This is one of a series of studies on tropical American grasses.

GENETICS

Physiological aspects of genetics, G. W. BEADLE (*Ann. Rev. Physiol., 1 (1939), pp. 41–62*).—A review of the more recent progress and problems along genetic lines.

The concept of species based on experiment, J. CLAUSEN, D. D. KECK, and W. M. HIESEY (*Amer. Jour. Bot., 26 (1939), No. 2, pp. 103–106*).—Extensive experiments on several plant groups during a series of years, in which the problems were viewed from morphologic, geographic, ecologic, cytologic, genetic, and to some extent also physiologic angles, led the authors to conclude that plants are organized into groups, the members of each of which are able to interchange their genes freely in all proportions without detriment to the offspring. These natural groups are said to correspond fairly closely to the species of the moderately conservative taxonomists working with plants that reproduce sexually. This experimental concept for species is tabulated and discussed in detail, including the terminology.

Effect of colchicine on chromosome number and cell size in some horticultural plants, C. L. BECKER. (Minn. Expt. Sta.). (*Minn. Acad. Sci. Proc., 6 (1938), pp. 26–30*).—Among the horticultural plants of different families treated, asparagus, among the vegetables, gave the most definite and quickest reactions, and it is deemed probable that several plants with larger cells and doubled chromosome number were obtained. Abnormal growth indicated possible chromosome doubling in some of the treated plants of beans, onions, peas, potatoes, and rhubarb. A number of annual and perennial flowers were also treated. Amaryllis flowers were deformed and proved to be sterile. Exceptionally large, vigorous shoots from some of the treated flax plants were believed to indicate possible chromosome doubling and larger cell size. Rough growth, indicating possible chromosome doubling in part of the tissues, was noted in a number of plants.

Inheritance of flower color in alfalfa, R. LEPPER, JR., and T. E. ODLAND. (R. I. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 3, pp. 209–216, figs. 2*).—Crosses were made among inbred alfalfa strains with blue and white flowers (*Medicago sativa*) and yellow flower (*M. falcata*). Crosses with Grimm (purple) and Hansen (white) showed a dominance of purple in F_1 with a two-factor difference. A cross between a Grimm selection (purple) and *M. falcata* (yellow) was light purple, indicating a three-factor difference with purple epistatic to yellow. Failure of pure yellow to appear was assumed as due to modifying factors. A light-purple-flowered plant arising from a cross between white- and yellow-flowered strains led to the assumption that a factor for purple may be carried in the white-flowered parent in the presence of the recessive condition of the factor for color production. A three-factor dif-

ference was suggested. The wide color range and the many colored plants in proportion to white from a cross between Hansen white and Cossack variegated alfalfa strains suggested the presence of at least four factors. A hypothesis for interaction of flower colors is offered to explain results obtained in these crosses.

A crinkled leaf mutation in alfalfa, T. E. Odland and R. Lepper, Jr. (R. I. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 128–130, figs. 2*).—An abnormality appearing in F[2] of *Medicago sativa* × *M. falcata* caused crinkling of leaf, which, when extensive, resulted in stunted growth and few flowers and seed. Behavior in F_2 and F_3 is described with factorial explanation.

An attempt to hybridize annual and perennial Avena species, L. P. V. Johnson and H. A. McLennan (*Canad. Jour. Res., 17 (1939), No. 2, Sect. C, pp. 35–37, fig. 1*).—Cross pollination of annual with perennial species of *Avena* did not result in the production of hybrid seeds, but certain specific combinations, i. e., *A. sativa* Early Ripe pollinated by *A. pratensis* and by *A. montana,* produced ovary stimulation.

Occurrence of albino seedlings in Victoria oats, D. C. Smith. (Minn. Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 2, pp. 63, 64, fig. 1*).—Albinos appearing in a plant progeny of Victoria oats are illustrated, with references to albinism in oats and other cereals.

A zygotic lethal in chromosome 1 of maize and its linkage with neighboring genes, R. A. Emerson. (Cornell Univ.). (*Genetics, 24 (1939), No 3, pp. 368–384*).—A Bolivian corn with mosaic red pericarp and cob was found to have a recessive zygotic lethal, *zl*, closely linked with the pericarp-color gene, *P* and the nearby genes male-sterile 17, ms_{17}, and tassel-seed 2, ts_2. The effect of *zl* is to prevent homozygosis of genes with which it is closely linked and thus to change a 3:1 to a 2:1 F_2 ratio when linked with a dominant gene or to prevent the occurrence of the one class when linked with a recessive gene. Available data placed this group of genes of the short arm of chromosome 1 of corn in the order $sr \leftarrow ms_{17}$ 1.7 ts_2 1.3 P 1.5 $zl \rightarrow br$.

Translocations in maize involving chromosome 8, E. G. Anderson (*Genetics, 24 (1939), No. 3, pp. 385–390*).—Data are presented on linkage relations with ms_8 (male sterile) and j_1 (japonica) for nine translocations involving chromosome 8 in corn. The cytological positions of seven of these were determined. These genes are in the terminal one-fourth of the long arm of chromosome 8, with j_1 nearest the end.

Morphology of two American wild species of cotton and of their hybrid, T. H. Kearney and I. E. Webber. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 6, pp. 445–459, pls. 2, figs. 5*).—The hybrid resulting from a cross between *Gossypium armourianum* and *G. thurberi*, wild, lintless, 13-chromosome species of cotton, both native in North America, proved to be much more fertile than any other hybrid obtained by crossing two truly wild species of *Gossypium*. The gross morphology of several characters distinguishing the parent species, their expression in F_1, and the segregation in respect to them in F_2 are considered in some detail. Segregation in a definite monohybrid ratio was indicated in regard to only one character, i. e., shape of cross section of the branchlets. Tendency to dominance of a greater number of genes from *G. armourianum* than from *G. thurberi* was evident in F_1 and F_2. As in the gross morphological features, the hybrid resembled *G. armourianum* more closely than *G. thurberi* in histological characters. The compact mesophyll and closed fibrovascular cylinder of the petiole of *G. armourianum* were partly dominant to the relatively loose mesophyll and separate fibrovascular bundles of *G. thurberi*. Bearings of these findings upon phylogenetic and taxonomic problems in *Gossypium* and their possible significance in cotton breeding are discussed.

Sex mechanism in polyploids of Melandrium, H. E. WARMKE and A. F. BLAKESLEE (*Science*, *89* (*1939*), *No. 2313*, *pp. 391*, *392*).—This is a summary of work on colchicine-induced polyploids of a white-flowered race of *M. dioicum*. It is concluded that the Y chromosome carried male-determining elements, contrary to the situation in *Drosophila* and *Rumex*, where this chromosome has been shown to play no role in primary sex determination.

A study of factors concerning herd management and herd production, L. COPELAND (*Jour. Dairy Sci.*, *22* (*1939*), *No. 4*, *pp. 229–239*, *fig. 1*).—Herd Improvement Registry records on 1,046 Jersey herds that had completed 12,274 lactations to January 1, 1938, were analyzed with reference to various management and production practices, including the percentage of dry cows, breeding efficiency, culling persistency, and production age of cows.

Note on a new recessive lethal in cattle, H. E. ANNETT (*Jour. Genet.*, *37* (*1939*), *No. 2*, *pp. 301*, *302*, *pl. 1*).—The occurrence is noted of a lethal factor involving a lower jaw of half the normal length in 5 of 28 calves produced by a Shorthorn bull mated to his daughters. The condition was completely recessive to the normal.

Variations in the number of vertebrae of swine, V. A. FREEMAN. (Mich. Expt. Sta.). (*Jour. Heredity*, *30* (*1939*), *No. 2*, *pp. 61–64*, *figs. 2*).—Continuing these studies (E. S. R., 73, p. 526), the numbers of thoracic and lumbar vertebrae of 182 pigs of different breeds that were born dead or died soon after birth in the college herd averaged 20.52±0.067 for Duroc-Jerseys and 21.27±0.046 for Yorkshires. There were no significant differences between the vertebra numbers of ♂♂ and ♀♀. Pigs with the larger numbers of vertebrae had longer carcasses, and selection for body length probably resulted in an increased number of vertebrae. More than one pair of genes seemed to be involved in vertebra number.

A genetic approach to the control of adult mortality in the fowl, C. D. CARPENTER and J. H. MARTIN. (Univ. Ky.). (*Poultry Sci.*, *18* (*1939*), *No. 2*, *pp. 168–174*, *fig. 1*).—Citing evidence of progress in reducing mortality by selection for resistance to pullorum disease reported by Roberts and Card (E. S. R., 74, p. 701) and to fowl typhoid reported by Lambert and Knox (E. S. R., 68, p. 823), the authors suggest controlling adult mortality genetically through line-breeding from large families of proved viability and finally by crossing superior lines to restore vigor lost through inbreeding.

The inheritance of melanism in pheasants, J. H. BRUCKNER. (Cornell Univ.). (*Jour. Heredity*, *30* (*1939*), *No. 2*, *pp. 45–52*, *figs. 2*).—The melanistic mutant in pheasants is primarily black throughout, both in chick and adult plumage. Several crosses with ringnecks showed that the character was due to a single, dominant, autosomal gene *M*. The single homozygous melanistic ♂ found produced 80 melanistic F_1s when crossed with ringneck ♀♀. The F_2 generation consisted of 136 melanistic and 41 ringneck birds, and the backcross produced almost equal numbers in more than 200 individuals. Evidently modifying genes were needed to induce the maximum expression of *M*. The possible relation of the melanistic mutant pheasants to the *Phasianus versicolor* species is discussed.

Sex and internal secretions, E. ALLEN, C. H. DANFORTH, and E. A. DOISY (*Baltimore: Williams & Wilkins Co.*, *1939*, *2. ed.*, *pp. XXXVI+1346*, *pls.* [*3*], *figs.* [*455*]).—Chapters bringing the development of the subjects up to date and based on recent surveys of the literature are presented in the different sections as follows: Biological basis of sex, including genetic and endocrine factors and their influence on secondary sex characteristics, by F. R. Lillie, C. B. Bridges, B. H. Willier, E. Witschi, L. V. Domm, and C. H. Danforth; physiology of the sex glands, germ cells, and accessory organs, including lactation,

by C. R. Moore, E. Allen, F. L. Hisaw, W. U. Gardner, C. G. Hartman, W. H. Newton, and C. W. Turner; biochemistry and assay of gonadal hormones, by F. C. Koch, E. A. Doisy, R. G. Gustavson, and W. M. Allen; the hypothysis and the gonadotropic hormones of blood and urine in relation to the reproductive system, by P. E. Smith, H. L. Fevold, E. T. Engle, A. E. Severinghaus, O. Riddle, and R. W. Bates; and additional factors in sex functions and endocrine applications in man, by W. O. Nelson, K. E. Mason, C. P. Stone, and J. P. Pratt.

Factors responsible for the sexual cycle in the English sparrow, Passer domesticus (Linnaeus): Ocular stimulation and spermatogenesis; effect of increased light ration on ovarian development, A. R. RINGOEN and A. KIRSCHBAUM. (Univ. Minn.). (*Jour. Expt. Zool., 80 (1939), No. 2, pp. 173–191, pls. 3, fig. 1*).—Studies of the influence of additional light supplied to sparrows during the nonbreeding season (with and without blindfolding) on the germ cell development showed that light on nonblindfolded birds greatly stimulated testicular growth and to a lesser extent ovarian development and enlargement in most cases These effects were prevented in most birds by blindfolding during the period when the extra light was supplied. Theelin injections partially duplicated the oviduct enlargement in light-treated ♀♀ but inhibited the ovarian development. A recent publication by Rowan (E. S. R., 80, p. 34) has indicated that the effect of light in activating the pituitary is to stimulate general activity of the bird.

Sexual dimorphism in down and adult plumage of the Pilgrim goose, J. P. QUINN. (U. S. D. A.). (*Jour. Heredity, 30 (1939), No. 2, pp. 55–57, figs. 2*).—Sexual dimorphism in the Pilgrim goose permits ready sex identification in that ♂♂ have white or light-gray plumage and light-colored bills, whereas ♀♀ have darker down and dark bills. Differences seem more pronounced with age. The similarity between these geese and the Alabama geese described by Gordon (E. S. R., 80, p. 326) is noted.

Regeneration of testis in the fowl, and its bearing on germ-cell theory, C. W. HOOKER and B. CUNNINGHAM (*Anat. Rec., 72 (1938), No. 3, pp. 371–385, pl. 1, fig. 1*).—A small fragment of the testicle inadvertently left after castration causes the resumption of growth of the comb and head furnishings within 1 mo., but in 5 cases among approximately 500 capons resumption of comb growth was delayed for more than 6 mo. Evidence, including the testicular tissue removed from 3 of the 5 animals and histological study of the testicular tissue present, suggested the regeneration of testicular tissue resembling autoplastic testes grafts, but full spermatogenesis was not observed. However, this evidence is taken to indicate that somatic (peritoneal) cells can be transformed into germ cells.

Mink breeding through the microscope, R. K. ENDERS. (U. S. D. A.). (*Amer. Fur Breeder, 11 (1939), No. 7, pp. 6, 8, figs. 5*).—This is a popular account of changes in the vaginal smear at different stages of the sexual cycle. Three fertilized ova were removed about 52 hr. after copulation. If the case is typical, minks may be considered to ovulate about 36 hr. after mating.

The effect of dilution and density on the fertilizing capacity of fowl sperm suspensions, S. S. MUNRO (*Canad. Jour. Res., 16 (1938), No. 10, Sect. D, pp. 281–299, figs. 2*).—Study was made of the influence of dilutions up to 1:128 of fowl semen with a synthetic solution and reductions in the number of sperm of cockerels used for artificial insemination. Records of the fertility and hatchability of the eggs showed that 88 percent of the eggs laid on the second day after insemination were fertile. Fertility and hatchability were based on the eggs laid during the 10-day period beginning on the second day after insemination. Fertility dropped rapidly with dilutions, even of 1:2,

and reached a zero point with semen dilutions of 1:64. Variations in the amount of semen injected at different dilutions showed definitely that the decrease in fertility with diluted semen was not due to a decrease in the number of sperm. When sperm serum was used as the diluent, there was almost no decrease in fertility with dilutions as great as 1:64 if the number of sperm per insemination was not decreased, but decreases in the number of sperm per injection from 231.5 million to 57.9 million were associated with some decreases in fertility. Fertility was further lowered as the number of sperm was decreased, and when the number reached 1 million almost complete sterility followed. There seemed to be no correlation between fertility and hatchability of the fertile eggs.

Survival of deciduomata during lactation in the rat, R. A. LYON (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 2, pp. 151, 152*).—Irritation of the endometrium from 5 to 17 days after parturition induced formation of the deciduomata in the rat. These had a shorter survival time when produced after the eleventh day of lactation than before, when survival was about 9 days.

Endocrine glands: Gonads, pituitary, and adrenals, H. M. EVANS. (Univ. Calif.). (*Ann. Rev. Physiol., 1 (1939), pp. 577–652*).—A summary of the recent research on the endocrines and their influence on reproduction and lactation cycles, including reference to their role in general metabolism.

Criteria of placental endocrine activity in the mouse, W. H. NEWTON and F. J. LITS (*Anat. Rec., 72 (1938), No. 3, pp. 333–349, pls. 2, fig. 1*).—In addition to the three criteria of placental activity in the mouse, (1) inhibition of oestrus, (2) maintenance of body weight, and (3) stimulation of parturition,[4] studies were made of the mammary glands of pregnant mice in which the fetuses were destroyed on the twelfth day, and in some cases in which the ovaries were removed at the time of fetal destruction with and without subsequent expulsion of the placentae. The results showed that the full development of the alveoli of the mammary glands was dependent on the presence of intact placentae. However, the degree of vacuolation was less than normal. The formation of an interpubic ligament of normal length was dependent on the presence of both placentae and ovaries.

The technic of hypophysectomy in the rabbit, W. H. NEWTON (*Endocrinology, 24 (1939), No. 4, pp. 468–474, fig. 1*).—Methods successful in the removal of the pituitaries from about 75 percent of the rabbits operated are described.

Significance of operative technic in the removal of the pituitary: A new transphenoidal approach to the pituitary of the dog and notes on the buccal approach to the pituitary in the rabbit, O. COPE and G. A. DONALDSON (*Endocrinology, 24 (1939), No. 4, pp. 475–487, figs. 14*).—Advantages and method of a new parapharyngeal approach to the pituitary in the dog and rabbit are presented.

Effects of light and darkness on activity of the pituitary of the rat, V. M. FISKE (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 2, pp. 189–191*).—Studies of the influence of light and darkness on the age of attainment of sex maturity in rats showed that in ♀♀ kept in the light the vaginas averaged to open earlier, and assays of the pituitaries from such animals showed larger amounts of follicle-stimulating hormone than were present in corresponding ♀♀ kept in the dark. However, darkness seemed to favor the production of larger amounts of luteinizing hormone. The pituitaries, testes, and seminal vesicles of ♂ rats kept from 21 to 175 days of age in the light were larger than those of ♂♂ kept in the dark during this period.

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[4] Jour. Physiol., 84 (1935), No. 2, pp. 196–207, figs. 6.

Biphasic effect of male sex hormone on the pituitary of the female rat, S. C. Freed, J. P. Greenhill, and S. Soskin (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 3, pp. 440–442*).—Different sized doses of testosterone propionate were found to have different effects when administered over a 16-day period to adult ♀ rats. A small dose, 0.05 mg., caused ovarian atrophy, whereas the larger dose, 1 mg., caused persistent corpora lutea and progestationlike changes in the uterus. Cessation of oestrous cycles followed the administration of all doses.

Augmentation of pituitary gonadotropic hormone by chlorophyll, plant growth hormones, and hemin, W. R. Breneman (*Endocrinology, 24 (1939), No. 4, pp. 488–493*).—Alcohol or water-soluble chlorophyll, two plant hormones, or hemin with pyridine, mixed with pituitary gonadotropic extract in vitro augmented its influence on the size of the ovaries of immature rats and the testes and comb of chicks. The augmenting effects were questionable or negative when administered separately.

Extraction and standardization of pituitary follicle-stimulating and luteinizing hormones, H. L. Fevold (*Endocrinology, 24 (1939), No. 4, pp. 435–446*).—The potency of extract, residue, and unextracted pituitary tissue from horses, hogs, sheep, and rats was compared. Assay methods for the follicle-stimulating and luteinizing hormones before and after separation are described, based on ovarian weights and structural changes produced.

Chemical differences of the follicle-stimulating and luteinizing hormones of the pituitary, H. L. Fevold (*Jour. Biol. Chem., 128 (1939), No. 1, pp. 83–92*).—In tests with immature ♂ and ♀ rats it was found that the follicle-stimulating hormone in water-soluble stock solutions from fresh sheep pituitaries was precipitated and inactivated by picrolonic, picric, and flavianic acids. Luteinizing hormone was not affected. The luteinizing hormone stimulated the interstitial cells of the testes to secrete ♂ hormone, a reaction that was augmented by the follicle-stimulating hormone, although the follicle-stimulating hormone alone was inactive. Luteinizing hormone was active on subcutaneous or intraperitoneal injection, but the follicle-stimulating hormone was only active in the former case.

The effect of sex hormones on the combs of castrated and normal cocks: Direct effect of folliculin on the cock's comb, J. Morató-Manaro and A. Albrieux (*Endocrinology, 24 (1939), No. 4, pp. 518–522, figs. 2*).—Neutralizing effects of ♂ hormone and folliculin when mixed in vitro prior to application in comb tests were verified. By dividing the combs of capons into anterior and posterior portions and treating one with folliculin it was found that the decreased size resulting was much greater in the half to which the hormone was directly applied than in the other half. A similar local effect was noted in increased comb growth induced by testosterone applied to a portion of the comb even though considerable testicular changes were induced. Assays of ♀ or ♂ hormone must be made on materials freed of the hormone of the opposite sex.

Improved procedure for biological titration of estrogenic and gonadotropic hormones in sera of pregnant women, A. E. Rakoff (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 2, pp. 195, 196*).—The use of unextracted serum, rather than extracted whole blood, was found to provide a more sensitive pregnancy test for the presence of oestrogenic hormone and gonadotropic hormone in the blood of pregnant women, as determined in experiments on castrated and immature ♀ mice, respectively.

Maintenance of the corpus luteum and inhibition of parturition in the rabbit by injection of estrogenic hormone, G. P. Heckel and W. M. Allen (*Endocrinology, 24 (1939), No. 2, pp. 137–148, figs. 5*).—The continued admin-

istration of oestrone or oestradiol monobenzoate to rabbits during the last third of the gestation period caused persistence of the functioning corpora lutea and postponed parturition. To obtain this result the ovaries must be present. All evidence pointed to the role of the corpora lutea in inhibiting parturition. Doses of oestrogenic hormone sufficient to delay parturition always caused death of the fetuses. Single doses were lethal without delaying parturition.

Copulatory activity in adult male rats following castration and injections of testosterone propionate, C. P. Stone (*Endocrinology, 24 (1939), No. 2, pp. 165–174, figs. 2*).—Sexual activity as measured by copulatory frequency was almost completely restored in castrated ♂ rats by injections of 1.25 mg. of testosterone propionate. After injections ceased sexual aggressiveness gradually waned, as following castration, but it was restored by further hormone treatment. The sexual drive of castrates treated with testosterone propionate, as measured in obstruction tests, was considered below that of normals.

The effect of prolonged testosterone propionate administration on the immature and adult female rat, M. and C. Mazer (*Endocrinology, 24 (1939), No. 2, pp. 175–181, figs. 10*).—Prolonged administration of testosterone propionate to immature ♀ rats caused a decrease in the weights of the pituitaries, adrenals, ovaries, and uteri and inhibited oestrus. The adult ♀ showed a similar reaction, but there was no significant decrease in pituitary weight. The ovarian atrophy was considered secondary to pituitary inhibition.

The effect of progestion-injections in ovarectomized guinea-pigs, R. Luft and L. Wallman (*Acta Path. et Microbiol. Scand., 16 (1939), No. 1, pp. 103–106*).—Injections of synthetic progesterone in oil into ovariectomized guinea pigs did not induce the same type of virilism that seems to result from extracts of the corpus luteum.

Induction of mating in the dog with pregnancy urine extract, J. H. Leathem and J. A. Morrell (*Endocrinology, 24 (1939), No. 2, pp. 149–156, figs. 6*).—The daily administration of 10, 25, or 50 rat units of pregnancy urine extract (Follutein) per kilogram to 11 anoestrous bitches induced mating in from 8 to 26 days. Ovariectomized ♀♀ failed to respond. Although follicle development was initiated, ovulation did not occur. Vaginal smears did not show full oestrus and pseudopregnancy did not follow mating.

Effect of pregnancy urine extract on lactation in the rat, I. L. Hathaway, H. P. Davis, R. P. Reece, and J. W. Bartlett. (Nebr. and N. J. Expt. Stas.). (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 2, pp. 214–218*).—Contrary to previous reports regarding the inhibition of lactation by pregnancy urine extracts (E. S. R., 78, p. 323; 79, p. 616), the injection of 100 rat units of Antuitrin-S daily during the first 5 days after parturition had no marked influence on lactation. The rate of growth of the suckling young was reduced as much as 22 to 33 percent by larger doses of the hormone, which also made the dams sick. Injections of similar amounts of physiological salt solution did not inhibit lactation.

Comparison of intravaginal and subcutaneous tests for estrone and estradiol monobenzoate, L. B. Stadler and W. R. Lyons. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 3, pp. 562–564*).—Although it was found that oestradiol monobenzoate when administered subcutaneously was about 5 to 10 times as potent as oestrone (E. S. R., 75, p. 329), the relative potencies of these substances in inducing cornification after intravaginal administration was not known. The intravaginal units of oestrone and oestradiol monobenzoate were approximately 0.02 and from 0.01 to 0.005, respectively, of the subcutaneous units of these substances. Oestradiol monobenzoate was about

10 and 30 times, respectively, as potent as oestrone when tested subcutaneously and intravaginally.

Age and sex differences in hormone content of the rabbit hypophysis, J. A. Saxton, Jr., and H. S. N. Greene (*Endocrinology, 24 (1939), No. 4, pp. 494–502*).—Study was made of the response of the thyroids, ovaries, and adrenals of immature guinea pigs to implants of pituitaries from 96 rabbits ranging in age from 10 days to 45 mo. The pituitaries from the immature rabbits at 10 days of age elicited no gonadotropic response, but an increasing follicle response was noted after 15 days (with luteinizing effects as well) from glands from rabbits older than 28 days. Pituitaries from mature animals stimulated follicle growth and luteinization. The gonadotropic stimulation was greater from young ♀♀ than from ♂♂. Thyroid and adrenal stimulation were noted from rabbits of all ages, but the amounts of stimulation induced varied with the sex and age of the rabbit.

The local effect of luteohormone on uterine mucosa of the infantile rabbit, J. C. Mussio Fournier, A. S. Albrieux, and O. Grosso (*Endocrinology, 24 (1939), No. 4, pp. 515–517, figs. 6*).—Studies with 60 infantile rabbits prepared for 8 days with follicular hormone showed that the uterine injection of progesterone brought about a more decided change in the mucous membrane than when the same dose was given subcutaneously. Deposition under the peritoneum around the horn gave a less pronounced reaction.

Increased sensitivity of the vagina to theelin, in the chronic castrated rat, as induced by the cotton swab procedure, F. E. Emery and E. L. Schwabe (*Anat. Rec., 72 (1938), No. 3, pp. 303–311, pl. 1, fig. 1*).—Frequent vaginal smears with a cotton swab in rats from 6 to 10 mo. after ovariectomy were found to give positive oestral smears. The vaginal epithelium became more sensitive to theelin than when vaginal smears were made by the pipette method.

Artificial insemination of farm animals, V. K. Milovanov (*Iskusstvennoe osemenenie sel'skokhozı̂aı̆stvennykh zhivotnykh. Moskva: Gosud. Izdatel., 1938, 4. ed., pp. 368, figs. 227*).—A discussion of the instruments used in collecting semen and methods employed in artificial insemination of all classes of livestock and poultry in Russia.

A serological investigation of bird eggs, with special reference to the possibility of differentiating species of birds [trans. title], O. Sievers (*Acta Path. et Microbiol. Scand., 16 (1939), No. 1, pp. 44–98*).—Differences in the serological reactions of different birds are noted.

FIELD CROPS

[Field crops work in Alaska, 1937] (*Alaska Sta. Bul. 7 [1938], pp. 17, 18, 19, 21, 22, 23–26, 31–33, fig. 1*).—Continued experiments (E. S. R., 77, p. 770) at the station and Matanuska Substation, reported on briefly, included variety tests with wheat, barley, oats, corn, sweet corn, grain sorghum, potatoes, soybeans, timothy, and other forage legumes and grasses; tests of legumes and other crops for winter hardiness; fertilizer tests with potatoes and bromegrass; investigation of the hardiness, growth habit, and fruiting of the yellow flowered alfalfa (*Medicago falcata*): pasture studies; and crop rotations. Average acre yields of the several cereals, potatoes, and hay are also recorded.

[Field crops research by the Georgia Coastal Plain Station, 1937]. (Partly coop. Ga. Expt. Sta., U. S. D. A., Univ. Ga., et al.). (*Georgia Coastal Plain Sta. Bul. 29 (1938), pp. 9, 10, 14–32, 32–40, 80–83, 119–125, 131, figs. 7*).—Experimentation with field crops again reviewed briefly (E. S. R., 80, p. 36) for 1937 and for different periods of years comprised variety tests with cotton, corn

for yield and resistance to weevils, oats, wheat, rye, grain sorghum, sorgo, sweetpotatoes, perilla, peanuts, lespedeza, soybeans for seed and forage, cowpeas, velvetbeans, crotalaria, winter cover crops, pasture grasses, and miscellaneous summer forage crops; breeding work with corn, cotton, oats, peanuts, soybeans, and pasture grasses; fertilizer experiments with corn, oats, and peanuts; winter cover crops for cotton and corn; and cultural (including planting) experiments with oats, wheat, peanuts, soybeans, velvetbeans, crotalaria, and winter cover crops. Fertilizer work with cotton, tobacco, and sweetpotatoes dealt with formulas, carriers of nitrogen, phosphorus, and potassium, and also with fertilizer placement for cotton and tobacco; nitrogen and potassium top dressings for cotton and sweetpotatoes; secondary nutrient elements for cotton; boron tests and fractional applications with tobacco; and ratios of organic : nonorganic nitrogen with sweetpotatoes. General recommendations on soils, varieties, plant beds, fertilizers, spacing and topping, and curing for flue-cured tobacco are also included.

Biennial report of the Northeast Louisiana Experiment Station, St. Joseph, Louisiana, 1937–1938, C. B. Haddon (*Louisiana Sta., Northeast Louisiana Sta. Bien. Rpt. 1937–38, pp. 23*).—Continued field crops experiments (E. S. R., 77, p. 181) reported on briefly included fertilizer experiments comprising carriers of nitrogen and potassium and rates of sodium nitrate, mixed fertilizers, production after different legume winter cover crops and after vetch seeded at different rates and turned under on several dates, yields following corn and soybeans, and after nitrogen carriers as supplements to vetch, all with cotton; spacing tests with cotton and corn; comparison of nitrogen sources for side dressing corn; corn alone v. corn with soybeans; and variety tests with cotton, corn (and hybrids), oats, alfalfa, and lespedeza.

[Achievements of agronomic research in Nebraska]. (Partly coop. U. S. D. A.). (*Nebraska Sta. Circ. 60 (1939), pp. 26–39, 43–46, figs. 7*).—Major accomplishments in research with field crops, described in those pages as made by the station since its establishment, were obtained in breeding work with corn and corn hybrids, wheat, alfalfa, sweetclover, grain sorghum, sorgo, and potatoes; adaptation studies with corn, corn hybrids, alfalfa, and oats; variety trials with corn, wheat, grain sorghum, sorgo, oats, barley, alfalfa, and potatoes; cultural experiments with corn, wheat, alfalfa, oats, barley, and potatoes; winter hardiness studies with wheat; milling and baking tests with wheat; fertilizer and rotation experiments with sugar beets; storage and seed potato production experiments with potatoes; studies of native meadow and pasture plants; and weed control investigations. Meritorious crop varieties developed or introduced by the station are noted.

[Field crops studies in Western Washington], M. S. Grunder. (Partly coop. U. S. D. A. et al.). (*Western Washington Sta. Rpt. 1938, pp. 10–14*).—Progress results are reported briefly from pasture studies on logged-off land, seedings of forage plants on burned-over land, rate of seeding tests with hairy vetch and a rye support crop, variety tests with soybeans (for seed and green forage) and alfalfa, analysis of flat pea at different stages of development, and nurseries for improvement of Italian ryegrass, orchard grass, and Ladino clover.

Preliminary tests with some plant hormones in the rooting of cuttings of certain forage plants, F. S. Nowosad (*Sci. Agr., 19 (1939), No. 7, pp. 494–503, pls. 3*).—When naphthyl-acetic and indolyl-acetic acids were applied to cuttings of timothy, alfalfa, and red clover, results indicated that the effects of the treatments are influenced by temperature, humidity, and light in the greenhouse; by degree of maturity of the tissue of cuttings; by pH and chemical concentration of the medium in which planted; and by the type and concentration of the hormone. No treatments gave satisfactory results in rooting timothy cuttings.

Optimum treatments for alfalfa and red clover approximated any one of the following with naphthyl-acetic acid: 50 p. p. m. in talc applied to the fresh scar of the cutting, basal ends of cuttings dipped for 12 hr. in 5–50 p. p. m. solution, or 10 p. p. m. fed in solution in nutrient culture solution.

A relationship between pollination and nodulation of the Leguminoseae, J. K. WILSON. (Cornell Univ.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 159–170*).—The evidence presented shows that a relationship may exist between pollination and nodulation of species of legumes. Plants completely self-pollinating may not bear nodules or will symbiose with few strains of rhizobia. If cross-pollination is obligatory, the plant will symbiose with a rather large number of strains. Strains of rhizobia symbiosing with self-pollinating plants appear predominantly monotrichic while those symbiosing with cross-pollinating plants seem predominantly multitrichic, although both morphological types may be found symbiosing with cross-pollinating plants. Such a relationship does not seem to correlate in any way with the order, tribe, genus, or species of the plants, except as it may be influenced by pollination. This suggested relationship, if valid, is expected to place symbiosis on a heritable basis and in the same category as certain heritable plant diseases.

Grasses and legumes for pasture and hay, W. WHITMAN, T. E. STOA, and H. C. HANSON. (Coop. U. S. D. A.). (*North Dakota Sta. Circ. 64 (1939), pp. 26 figs. 16*).—Practices in pasture and hay production, based extensively on cooperative research and experience and discussed in some detail, include choice of perennial grasses and legumes; selection of land, seedbed preparation, seeding and other cultural practices, and seeds mixtures for eastern and western North Dakota; seeding eroded fields; use of supplementary forage crops; and fencing and management.

Improving the quality of hay, A. H. LEWIS (*Jour. Min. Agr. [Gt. Brit.], 46 (1939), No. 1, pp. 77–82*).—Confirmation under British conditions of the results of Sprague and Hawkins (E. S. R., 79, p. 327) is reported.

Alfalfa nursery technic, H. M. TYSDAL and T. A. KIESSELBACH. (U. S. D. A. and Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 83–98, fig. 1*).—Alfalfa nursery plat technic was studied, 1935–37, with respect to number of rows per plat, distance between rows, alley space between plats, removal of border rows at harvest, interplat varietal competition, spacing of plants within the row, rates of planting, and plat distribution. The Hardistan and Ladak varieties were compared in 16 replications of 9 types of nursery plats and adjacent field plats. The nursery plats were 16 ft. long with variations of 1, 3, 4, and 8 rows per plat, and the row-spacings under comparison were 7, 18, and 24 in. All plats were solid-drilled except in one group where the plants were spaced 12 in. in rows 24 in. apart.

The most serviceable types of plat for advanced nursery testing, based on specific principles indicated by these studies and general experience with alfalfa nurseries, appear to be somewhat optional among solid-drilled from 5 to 8 rows spaced 7 in. apart, with a 12- to 14-in. alley between border rows, or solid-drilled from 3 to 5 rows spaced 12 in. apart with an 18-in. alley between border rows. Since removal of border rows is difficult and expensive with alfalfa and since very little error has been found with such plats due to border effect, it is suggested that the entire plat may be harvested for yield, with the possible exception of removing border rows in case adjacent stands are decidedly different The plats may be 16 ft. or longer, and the alley space should be included in the plat area. Single rows spaced from 18 to 24 in. apart are permissible for preliminary nursery testing.

Barley and malt studies.—II, Experimental malting of barleys grown in 1935, J. G. and A. D. DICKSON, H. L. SHANDS, and B. A. BURKHART. (U. S. D. A. and Wis. Expt. Sta. coop. 11 expt. stas. et al.). (*Cereal Chem., 14 (1937), No. 3, pp. 316–327, figs. 5*).—The malting data reported for samples of commercial barley tested under commercial and experimental procedure, for show samples from 6 States, and for 5 varieties grown at 11 experiment stations in uniform regional series in 1935 supplement data on the previous crop (E. S. R., 74, p. 479).

An estimation of the number of top-crossed plants required for adequate representation of a corn variety, G. F. SPRAGUE. (Mo. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 1, pp. 11–16*).—Study of variance among top crosses on individual plants of Reid Yellow Dent and Krug corn in relation to variance associated with random error indicated that the variance of means of samples of from 10 to 20 plants would be unimportant compared with that due to random error. Preparation of seed for planting from bulked seed from this many plants would not introduce serious errors unless the size of samples drawn from the bulked lot is small or individual plants contribute widely different numbers of seeds to the total population.

Field corn in Massachusetts, W. G. COLBY and R. W. DONALDSON (*Massachusetts Sta. Bul. 356 (1939), pp. 16, fig. 1*).—Information is given on the adaptations of corn in Massachusetts; choice of varieties and hybrids; corn areas; cultural methods and field practices, especially fertilization; and control of European corn borer. Varieties and hybrids grown in comparison at Amherst, 1936–38, are grouped according to maturities with maturity dates and grain and stover yields.

The foliar diagnosis of Zea mays subjected to differential fertilizer treatment, W. THOMAS and W. B. MACK. (Pa. Expt. Sta.). (*Jour. Agr. Res. [U. S.] 58 (1939), No. 7, pp. 477–491, figs. 6*).—Corn plants, examined by the method of foliar diagnosis (E. S. R., 80, p. 188), were grown on plats of the Jordan fertility experiment, unlimed but treated as follows since 1881: Check (0), N, P, K, NP, NK, PK, and NPK. The nitrogen carrier was dried blood; phosphorus, superphosphate; and potassium, the chloride.

A relationship existed between the N percentage in the dried leaf and in the fertilizer but none between N in the leaf and yield nor between N in the fertilizer and yield except when accompanied by P and K. Relationships existed between the P percentage in the leaf and in the fertilizer, between P in the leaf and yield, and between P in the fertilizer and yield. No relationship existed between the K contents in the leaf and fertilizer, between the variation of K in the leaf and variations in yield, or between K in the fertilizer and yield. The percentage content of CaO and MgO in the leaves of plants receiving P, NP was much higher than in those receiving PK, NPK.

Analyses of the third leaf from the base at four periods during growth indicated that low intensities of nutrition are associated with low yields in check, P, N, and NP treatments and high intensities with high yields in PK and NPK; but when "luxuskonsumption" of potash occurs relatively low yields may be associated with relatively high intensities of nutrition as in K and NK. The composition of the composite NPK-unit (E. S. R., 79, p. 23) was related to grain yields: Group 1, poorly nourished plants, check, NK, N, and K, are characterized by low P in the NPK unit; group 2, better nourished plants, P and NP, with very high P, high N, and very low K in the NPK unit; and group 3, best nourished plants, PK and NPK, with values for N, P, and K intermediate between those of groups 1 and 2.

Cotton breeding and seed supply, A. BRIZI (*Roma: Internatl. Inst. Agr., 1938, pp. 71, figs. 5*).—Information is presented on breeding objectives, species

and varieties of *Gossypium*, propagation and conservation of varieties and strains, and trends of cotton breeding in major cotton growing countries (with 63 references), as an appendix to the monograph on World Cotton Production and Trade (E. S. R., 78, p. 119).

Viability of seeds of cotton as affected by moisture and age under different methods of storing, F. B. Flores (*Philippine Jour. Agr., 9 (1938), No. 4, pp. 347-356, fig. 1*).—Sun-dried cottonseed, whether delinted, ginned, or in seed cotton, when stored in airtight containers retained enough viability for planting purposes after 1 yr. in storage, while the same kind of seeds kept in burlap sacks were useless after 6 mo. in storage. Sun-dried and air-dried seed cotton maintained higher viability percentages than either ginned or delinted cottonseeds in practically all the tests as storage was prolonged. A definite relation was indicated between the moisture content of the seeds during storage and the rapidity of deterioration.

Relation of temperature and moisture content to longevity of Chewings fescue seed, V. Kearns and E. H. Toole (*U. S. Dept. Agr., Tech. Bul. 670 (1939), pp. 27, pl. 1*).—Chewings fescue (*Festuca rubra* var. *commutata*) seed shipped under different conditions from New Zealand and Virginia- and Oregon-grown seed of high viability were stored at different moisture contents and temperatures, and their germination was determined at intervals. Advantages of shipping seed under cool storage conditions in oversea transit were lost in a few months after arrival in the United States unless the seed was stored subsequently at as low as 2° C. or unless it was dried out after arrival to not exceed 10-percent moisture. Seed dried before oversea shipment and kept dry showed after from 18 to 26 months' storage at room temperature germination equal to that shown by nondried seed on arrival in this country. See also an earlier note by Foy (E. S. R., 73, p. 313).

The tests of domestic seed, ranging from about 8 to 14 percent moisture content and stored in sealed jars at −10°, 2°, 10°, 20°, and 30°, showed the direct association of moisture content and storage temperature on the life of the seed. Fescue seed lost vitality very rapidly at 30° if the moisture content was high. At 30° germination fell about 20 percent in 5 weeks, 4 mo., and 12 mo. at moisture contents of 14, 12, and 10 percent, respectively. The seed was practically dead in from 3 to 5 mo. at 14-percent moisture and in 8 mo. at 12-percent moisture. When stored at 30° with a moisture content of about 10 percent, fescue seed retained vitality much longer than when stored at 20° with about 14-percent moisture, but not as long as seed stored at 10° with a 14-percent moisture content. However, seed with 10-percent moisture stored at 20° germinated above 90 percent after 26 months' storage v. 58 and 77 percent for seed having a 14-percent moisture stored at 10°.

The moisture content of fescue seed stored at 30° evidently should not exceed 8 percent, stored at 20° 10 percent, and stored at 10° not over 12 percent for long-time storage. No benefit comes from shipping seed with high moisture content under cool-storage conditions, because it will lose vitality on arrival in this country as rapidly as seed not shipped under cool storage and its initial germination on arrival would only serve to mislead the trade. Seed that dies slowly goes through a period when many sprouts develop abnormally during germination. Such sprouts are worthless for they would never develop to maturity.

Temperature and other factors affecting the germination of fescue seed, V. Kearns and E. H. Toole (*U. S. Dept. Agr., Tech. Bul. 638 (1939), pp. 36*).—Germination studies with several species of *Festuca* showed that fescue seed tested immediately after harvest required a relatively low temperature for germination, especially in seed collected when immature or mature compared

to seed collected when dead ripe. With fresh seed, optimum temperatures for germination were for mixed commercial strains of *F. rubra* 10° C.; Chewings fescue (*F. rubra commutata*), creeping red fescue (*F. rubra*), and reed fescue (*F. elatior arundinacea*) from 15° to 25°; hair fescue (*F. capillata*) from 10° to 25°; and for meadow fescue (*F. elatior*) 15°, 20°, or from 15° to 25°. The test period needed for maximum germination at the optimum temperature was for meadow fescue 14 days; for Chewings, creeping red, and reed fescues, and *F. rubra* strains 21; and for hair fescue 28 days. As the seed aged it germinated over a wider range of temperatures. A few months after harvest fescue seed germinated its maximum at the alternation from 20° to 30°, although the rate was slower than at lower temperatures.

For fresh seed of Chewings fescue the best constant temperature was 10°, but both rate and final percentage of germination for older seed were lower at 10° and the best constant temperature rose to 15° and 20°. Hair fescue and *F. rubra* strains made the same change in response to temperature with age but did not decrease in germination at 10°. Fresh seed of hair, creeping red, and reed fescues showed low germination at constant temperatures, the best being 10° for hair fescue and 15° for the other two species. Hair fescue, which required a very low temperature alternation when fresh, needed a longer period after harvest before it would give a maximum germination at from 20° to 30° than species showing from 15° to 25° as optimum for fresh seed. Seed of all species prechilled at 5° for about 7 days gave increased germination at temperatures ordinarily too high for complete germination of fresh seed or that not after-ripened. Seed of reed and hair fescues kept in dry storage at low temperatures showed a temperature response at high constant temperatures comparable to seed not afterripened. Hair fescue was the only one responding to light and nitrate in addition to optimum temperature. Light and nitrate benefited the other fescues only at temperatures unfavorable for complete germination.

Seed flax in eastern Washington, O. E. Barbee and E. G. Schafer (*Washington Sta. Bul. 370 (1939), pp. 16, figs. 3*).—Practices recommended for growing seed flax in eastern Washington, based on experimental results and experience, include the choice of the Bison variety, planting in early spring at the rate of from 40 to 45 lb. per acre not deeper than 1 in. on a well-prepared seedbed on weed-free land and harvesting with a combine if ripe and dry, or if not dry or containing green weeds, cutting with the binder or swather and drying before threshing. Alfalfa and sweetclover have made good stands when sown with flax as a nurse crop.

The acre yield of flax obtained in 1938 by 33 farmers reporting on 2,349 acres varied from 4 to 14 bu., averaging 7 bu. When local prices of December 26, 1938, were applied to yields of different crops obtained under experiment, flax returned a lower acre value than winter wheat, oats, and barley, but higher than spring wheat and peas. The spread in yield between flax and wheat evidently is greater in Washington than in the North Central States, and flax growing does not compare as favorably with wheat in Washington as in that area. Information is also given on the national status of the crop and its commercial movement.

Sun injury to cut potato seed, W. C. Edmundson. (U. S. D. A.). (*Amer. Potato Jour., 16 (1939), No. 4, pp. 98–103*).—Yields and stands following the planting at Greeley, Colo., in 1937 and 1938 of seed of Rural New Yorker No. 2 and Triumph potatoes, freshly cut and suberized, exposed for 0, 2, and 4 hr., and whole seed not exposed indicated that in sections where planting of the late crop is delayed until the temperature is high, cut seed may be injured by

direct exposure to the sun. Seed not exposed, whether freshly cut, suberized, or whole, produced similar yields in the 2 yr. Although suberized seed was injured by direct exposure, the severest injury was sustained by freshly cut seed, the extent being governed largely by duration of exposure.

Immediate germination of certain selfed and hybrid potato seed, M. L. ODLAND. (Minn. Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 3, pp. 67–71*).—Study of 22 genetically different samples of recently harvested potato seed revealed marked differences in degree of delayed germination. Certain samples completed germination before transplanting time whereas other samples required about 90 days to complete germination. Seed 1 yr. or older when planted may exhibit delayed germination, although one lot of selfed seed showed no delayed germination over 2.5 yr.

Correlation of seedling performance in the greenhouse and subsequent yield in the field, J. R. LIVERMORE. (Cornell Univ.). (*Amer. Potato Jour., 16 (1939), No. 2, pp. 41–43*).—Analysis of data from a greenhouse planting of approximately 2,000 potato seeds in 1936 and a field planting of the tubers from these seedlings in 1937 at Ithaca, N. Y., indicated that the association between greenhouse growth and field yield was so slight that greenhouse seedling growth would be of little help in detecting superior productivity.

The comparative productiveness of seed potatoes grown on sandy and on peat soils in central Wisconsin, A. R. ALBERT, R. H. LARSON, and J. C. WALKER. (Univ. Wis.). (*Amer. Potato Jour., 16 (1939), No. 1, pp. 16–24*).—Seed potatoes of several varieties grown on peat soil outyielded seed from mineral soils when compared, 1934–37, in several localities.

Reasons for the low average yields of potatoes in Ohio, J. BUSHNELL. (Ohio Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 3, pp. 67–70, fig. 1*).—The current low average yield of potatoes in Ohio is attributed to the growing of a large proportion of the crop in small patches on farms not equipped to spray properly, with yields seriously reduced by flea beetles and leafhoppers; the ordinary rotations and methods of handling the soil which do not maintain an adequately loose condition for potatoes; and the high summer temperature which probably would of itself prevent Ohio yields from equaling the yields of cooler potato districts.

Fertilizer and nutrition studies with the potato in 1938, O. SMITH. (Cornell Univ.). (*Amer. Potato Jour., 16 (1939), No. 3, pp. 53–66*).—Results of investigations during 1938 on fertilizers, cover crops and green manures, soil reaction, and sand and solution culture studies with the potato are summarized, with a list of 87 titles.

Further studies on the placement of fertilizer for potatoes, B. E. BROWN, H. H. ZIMMERLEY, G. V. C. HOUGHLAND, W. H. REDIT, and L. G. SCHOENLEBER. (U. S. D. A. and Va. Truck Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 4, pp. 81–93, figs. 4*).—Previous cooperative studies (E. S. R., 76, p. 620), showing that in general superior results followed application of fertilizer in a band on each side of, about 2 in. from, and practically on a level with the potato seed piece, were supplemented by a placement study comparing complete fertilizer with separate ingredients. Yields per acre, 1936 and 1937, on Sassafras sandy loam at Onley, Va., after 6–6–5 (NPK) fertilizer in furrow, averaged 163.5 bu.; 6–6–5 on each side, 166; 0–6–5 in furrow, 6–0–0 on each side 174; 0–6–5 on each side, 6–0–0 in furrow 141.5; 6–0–5 in furrow, 0–6–0 on each side 135.5; 6–0–5 on each side, 0–6–0 in furrow 193.5; 6–6–0 in furrow, 0–0–5 on each side 148; and 6–6–0 on each side, 0–0–5 in furrow 159 bu. Nitrogen carriers when applied in the row retarded emergence and lowered yields to the greatest extent. Potash had a minor retarding influence. The final stand was less affected, but retardation in emergence indicated a physiological set-back from which plants

concerned failed to recover enough to produce normal yields. Placement of superphosphate in contact with the seed piece, especially since it exerts no appreciable injury at normal rates, appeared desirable. Since certain nitrogen carriers when in contact with the seed piece are most injurious, they might be placed on each side in combination with the potassium materials to avoid injury and to promote fertilizer efficiency.

Eighteen varieties of edible soybeans: Their adaptability, acceptability, culture, and characteristics, J. W. Lloyd and W. L. Burlison. (Coop. U. S. D. A.). (*Illinois Sta. Bul. 453* (*1939*), *pp. 381–439, pl. 1, figs. 15*).—Cooperative tests in 54 counties indicated the adaptation of the vegetable type of soybeans to production throughout Illinois and the acceptability of the green shell beans as a home garden vegetable. Varieties well adapted to central Illinois also were reported to thrive in other Midwestern States, but for northern Illinois, Iowa, and localities farther north the early varieties were most reliable. Canners' tests showed the feasibility of processing an acceptable product from certain varieties.

The 18 superior varieties of edible soybeans tested at Urbana, i. e., very early, Giant Green; early, 80494, Bansei, and Fuji; midseason, Illini, Hokkaido, Jogun, Willomi, 80490–1, 89162, 84979, and 87617; and late, Illington, Imperial, 87606, Funk Delicious, Emperor, and Higan, showed wide differences in earliness, duration of edible period, plant height, erectness of growth, appearance of pod, and tendency to shatter. While all yielded well, some were heavier producers than others. The yield of green shelled soybeans was about 2½ times the yield of dry ripe beans. Those most attractive in color and size of pod and size of beans also rated very good in table quality. Analyses of the 1938 crop showed that the protein content of the 18 varieties ranged from 36.43 to 44.13 percent and the fat content from 18.05 to 22.42 percent.

Most of these varieties are suitable for use as dry beans as well as green shelled beans. For a succession of green soybeans in Illinois one variety should be selected from each group. The method of growing vegetable soybeans was about the same as for growing the field type, except that they were always planted in rows far enough apart to permit cultivation. Harvest for use as green shelled beans may begin as soon as the beans attain nearly full size and the pods appear well filled and green or yellowish green in color. Mature soybeans should be harvested promptly to avoid excessive shattering and cured properly before threshing. The station's experience indicates that if soybeans contain more than 15 percent moisture at time of threshing special handling is required to prevent spoilage.

Directions for shelling and cooking green soybeans are appended. See also an earlier note (E. S. R., 79, p. 563).

Acclimatization of soybean in the Philippines, I, P. A. Rodrigo (*Philippine Jour. Agr., 9* (*1938*), *No. 3, pp. 223–252, pls. 6*).—Outstanding varieties for rainy season culture in tests over nearly 5 yr. included Macoupin, Manchu, Dunfield, Hakubi, Illini, and Otama-ao strains 2 and 3 from Japan. More recent introductions of merit were Yellow Biloxi Hybrid, Head Green, American Black, and Mamloxi.

Balanced incomplete block and lattice square designs for testing yield differences among large numbers of soybean varieties, M. G. Weiss and G. M. Cox. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul. 257* (*1939*), *pp. 289–316, fig. 1*).—The features of balanced incomplete block and lattice square designs, quasi-factorial arrangements adapted to the testing of differences between large numbers of varieties, are described and their analysis and relative precision on soils of varying homogeneity illustrated by soybean variety trials.

The efficiency factor of these designs, because of confounding of variety differences with block effects, is lower than that of randomized complete block designs, yet on soil of normal variability the designs permit elimination of enough variability due to soil differences to more than offset this loss. Merits of the lattice square arrangement were demonstrated on extremely heterogeneous soil where use of the design resulted in a gain in precision of 150 percent over that of randomized complete blocks. A case in which the design on very uniform soil results in a loss of precision of 31.5 percent is also illustrated. Use of these designs is recommended in variety trials involving numerous varieties when the trials are conducted on variable soil and when differences between varieties are relatively small.

Studies in experimental technique: Selection of layout, blocks versus Latin squares, R. J. Borden (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 43 (1939), No. 1, pp. 7–10*).—The value of laying out field experiments so that their results may be studied by modern refinements of statistical methods is exemplified by a multiple Latin square arrangement of a test of rates of applying potassium to sugarcane.

The availability of insoluble phosphates to sugar cane, A. S. Ayres (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 43 (1939), No. 1, pp. 45–56, fig. 1*).—In availability to H 109 sugarcane, reverted and raw rock phosphates were found to equal calcium superphosphate in the acid, high phosphate-fixing soil used. All three forms resulted in yields 10 times those obtained in the controls. Super and reverted phosphates on limed soil resulted in larger yields than on unlimed soil. Lime without added phosphate did not result in appreciably increased growth. Addition of lime at the rate of 9 tons per acre did not affect adversely the quality of the juice. Marked differences in supplies of available phosphate did not result in differences in the percentages of phosphate in millable cane, although the tops reflected the supply of phosphate in the soil. Symptoms of phosphate deficiency in the control canes were lack of normal growth, yellowish color of the leaves, and complete absence of tillering.

The markedly higher values for phosphate (rapid chemical method) at harvest, found in soils fertilized with raw rock phosphate compared with those receiving superphosphate, were interpreted as indicating that a considerable portion of this insoluble phosphate was still present in the soil at harvest in much its original form. Under field conditions the period required for the solution and subsequent fixation of raw rock phosphate possibly would be much longer. To a lesser extent reverted phosphate was found to resist fixation.

A pictorial showing the effects of delayed weed control upon subsequent growth of sugar cane, R. J. Borden (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 43 (1939), No. 1, pp. 11–15, figs. 9*).—Effects of delayed weeding upon sugarcane growing in soils having specific variations in available plant foods are illustrated.

Storage of sugar beets under conditions of high humidity and low temperature, J. O. Gaskill and H. E. Brewbaker. (U. S. D. A. and Colo. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 109–115, figs. 4*).—Sugar beet roots saved for seed production were kept during five winter storage periods with negligible loss from rotting in open crates, without coating or packing material, by maintaining the temperature of the root cellar a few degrees above freezing and the humidity near saturation, and by providing for thorough air circulation. Sugar beets stored 0, 41, 84, and 125 days in the cellar, or 125 days in an outdoor pit-silo, did not differ significantly in root weight. Gradual but statistically significant decline in sucrose percentage occurred with the longer storage periods. The sucrose loss averaged 0.04 percent per day, attributed largely to respiration. Comparison of cellar-stored and pit-siloed roots after

125 days' storage indicated equivalent behavior. The cellar storage method as described is convenient and efficient for storing small lots of sugar beet breeding strains.

Strophostyles helvola (L.) Britton, its habits and probable value on eroded areas, J. N. MARTIN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 12 (1937), No. 1, pp. 25–35, pl. 1, fig. 1*).—Trailing wild bean (*S. helvola*), an annual, propagating by seed and common throughout the Mississippi Valley and States east to the Atlantic, is remarkably resistant to heat and drought. While generally found on sandy soil, it thrives on clay soils and on eroded banks and sides of gullies. It may be of value for cover and food for birds and as a green manure and nitrogen replenisher, and on eroded waste areas. The seeds, shed soon after ripening, are hard, with impermeability due to a definite light line. In the field the seeds are made permeable by variations in temperature and probably moisture of the dormant season and germinate in May and June of the season after their production. Seed coats are easily made permeable by abrasion, and good germination may be secured at any time.

Seeds and seedlings of the taro, Colocasia esculenta, K. KIKUTA, L. D. WHITNEY, and G. K. PARRIS. (Hawaii Expt. Sta.). (*Amer. Jour. Bot., 25 (1938), No. 3, pp. 186–188, figs. 2*).—The course of germination of taro seeds and the development of the seedlings are described and illustrated.

Studies on the salt requirement of tobacco, F. DE PERALTA and D. B. PAGUIRIGAN (*Philippine Jour. Agr., 9 (1938), No. 3, pp. 253–272, pls. 7, fig. 1*).—In studying the nutrient requirement of Ilagan Sumatra tobacco, 16-day-old seedlings (from sowing) germinated in quartz sand were grown in sand and solution cultures. The most promising nutrient medium had about 0.0132 gram molecule per liter (of all salts), the salts being present in about the molecular proportions: $KH_2PO_4 : Ca(NO_3)_2 : Ca(H_2PO_4)_2 : MgSO_4 = 2:6:1:2$. As usual, a trace of iron in the form of ferric phosphate or ferrous sulfate is added to the culture medium. In addition to 10 essential elements, a little boron was necessary in the nutrient medium in order for the plant to develop to full maturity. Addition of a small quantity of $Ca(H_2PO_4)_2$ to a nutrient medium containing KH_2PO_4, $Ca(NO_3)_2$, $MgSO_4$, $FePO_4$ and H_3BO_3 improved the nutritive value of the mixture. The plant developed vigorously in a complete nutrient medium containing nitrate nitrogen. Using ammonium sulfate as a nitrogen carrier in the absence of nitrifying bacteria greatly retarded if not inhibited plant growth.

Tobacco growing in Canada, N. A. MACRAE (*Canada Dept. Agr. Pub. 633 (1938), pp. 45, figs. 34*).—Types and varieties of tobacco; climate, soils, and fertilizers; plant beds; cultural and harvest operations; seed production; curing and fermentation; preparation of tobacco for market; and measures for control of diseases and insects affecting tobacco are discussed in this revision of a bulletin noted earlier (E. S. R., 35, p. 534).

Effect of fertilizers and method of their application on nodulation, growth, and nitrogen content of hairy vetch, T. H. ROGERS and D. G. STURKIE. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 141–148, figs. 2*).—Hairy vetch (*Vicia villosa*) produced about 20 percent less growth when superphosphate and triple superphosphate came in contact with seed inoculated with a commercial culture than when the fertilizer was mixed with the soil before planting, and made 158 percent more growth when superphosphate was mixed with soil before adding soil inoculant than when it came in contact with the soil inoculant. Growth was not reduced seriously when basic slag or equal amounts of dolomite and superphosphate were applied in contact with inoculated seed. Injury by superphosphate in contact with inoculated seed was partly reduced or counteracted by dolomite. Fertilizer or inoculation increased the nitrogen content of vetch plants; when both were used the highest percentage of ni-

trogen and the most vegetative growth were obtained. The percentage of nitrogen in plants was not affected by the method of applying fertilizers. Regardless of how fertilizer was applied, commercial inoculant was superior to soil inoculant but only slightly so without fertilizer. The ratio of tops: roots increased as the vetch grew older and was highest with treatments producing the largest vetch yields, and most of the nitrogen was in the tops. Presence of nodules on vetch roots was not a sure indication that the plants were properly inoculated.

Effects of fertilizer applications and other cultural practices on some kernel characteristics of winter wheat, J. T. SULLIVAN, H. R. KRAYBILL, C. B. GUSTAFSON, G. H. CUTLER, G. A. BRINSON, R. R. MULVEY, and G. P. WALKER (*Indiana Sta. Bul. 432 (1938), pp. 48, figs. 2*).—Numerous samples of Purkof, Michigan Amber, Purdue Nos. 1 and 3, and 21–2–11 wheat, grown in 1931–33 on fertilizer, rotation, and cultivation test plats in different locations in Indiana, were subjected to chemical, milling, baking, and other tests.

Spring applications of nitrogen fertilizers tended to increase the hardness characteristics, such as percentages of protein and of vitreous kernels, especially in wheat receiving the latest application on May 20, but did not increase significantly fermentation time, granulation number, and test weight. Nitrogen applied in autumn had very little effect on the hardness characteristics. Previous legume crops in rotation, however, tended to increase vitreousness and amount and quality of protein, as well as test weight.

Phosphorus applied alone or in mixed fertilizers increased yield and decreased vitreousness, protein content, and the loaf volume, and had small effect on granulation number. In many instances fermentation time was increased, although quantity of protein was lowered. Effects with superphosphate were more marked than with rock phosphate on limed plats, but the larger amounts of rock phosphate were more effective than superphosphate on unlimed plats.

Plats never fertilized produced wheat of low yield, shrunken grains, and relatively high protein content. Lime alone increased yield considerably, but the kernels were still small and high in protein. Complete fertilizers used with lime resulted in higher yields and wheat with lower protein content, higher kernel weight and test weight, and lower vitreousness. Clover preceding wheat in the rotation increased hardness as measured by protein content, vitreousness, and time test, while wheat preceding wheat decreased these hardness characteristics. Milling and baking tests on a limited number of samples indicated that protein content of milled fractions and, in general, loaf volumes, were correlated with protein content of wheat.

Wheat improvement in the eastern United States, B. B. BAYLES and J. W. TAYLOR. (U. S. D. A.). (*Cereal Chem., 16 (1939), No. 2, pp. 208–223, fig. 1*).—The distribution of wheat varieties in the eastern United States is indicated, with discussion of losses due to winter-killing, hessian fly, lodging, leaf and stem rust, loose smut, bunt, and other diseases, and the possibility of reducing these losses through plant breeding.

The technic of producing a new soft wheat, W. W. WORZELLA. (Ind. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 2, pp. 188–194, figs. 4*).—Objectives and features of field and laboratory methods in wheat improvement are described.

Seed impermeability and viability of native and introduced species of Leguminosae, M. E.-J. HUTTON and R. H. PORTER. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 12 (1937), No. 1, pp. 5–24, figs. 3*).—Seeds of *Lespedeza virginica* and *Robinia pseudacacia* were not changed significantly in impermeability by laboratory storage for 2 yr. That in seeds of *L. capitata*, *Strophostyles helvola*, and soybeans declined significantly and usually with a reduction in the percentage of normal seedlings. Impermeability of *S. helvola* was correlated

directly with moisture content of the seed, increasing rapidly when the moisture content fell below 21 percent. Shaking in a glass bottle for 10 min. practically eliminated impermeability in seeds of *L. capitata*, *L. virginica*, *Amorpha fruticosa*, *R. pseudacacia*, and soybeans, with resultant development of normal seedlings. The shaking caused fissures to develop at the base of the hilum in seeds of *A. fruticosa* and *L. capitata* through which water entered the embryo, with consequent germination. The bibliography includes 41 references.

Scarification studies on southern grass seeds, G. W. BURTON. (U. S. D. A. and Ga. and Ga. Coastal Plain Expt. Stas.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 3*, *pp. 179–187*, *fig. 1*).—Removal of the paleas, treatment of seed in concentrated technical H_2SO_4 for 5 min., and removal of all glumes from the caryopses by rubbing the seeds between sandpaper blocks, all hastened germination of Bahia grass (*Paspalum notatum*) seed materially. Seed treated 10 min. in concentrated technical H_2SO_4 germinated 52 percent in 8 days and untreated seed 0.3 percent in 3 weeks. Scarification with crude sulfuric acid (used in making superphosphate) for from 45 to 60 min. proved about as effective as a 10-min. scarification in concentrated technical H_2SO_4, was much cheaper than technical acid, and there was less danger of killing seed by overtreatment. Indications were that the optimum treatment for one lot of seed may be injurious for another lot. The wisdom of making several small preliminary treatments before treating large quantities of seed is evident. Treatments of 70° C. dry heat for 4 hr., soaking in water 24 hr. with and without reduced pressure, and with concentrated HCl for 5 min. did not increase the germination significantly. Bahia grass seed, unlike many grasses, seemed to require no rest period.

Scarifying Dallis grass (*P. dilatatum*) seed with concentrated technical H_2SO_4 for 5 min. hastened germination materially. The value of 35 percent NaOH as a mild scarifying agent was demonstrated. Five- and 10-min. treatments with either 50 percent HCl or 35 percent NaOH increased the germination rate of centipede grass (*Eremochloa ophiuroides*) seed. Germination of unhulled seed of Bermuda grass was hastened by treatment with concentrated HCl for 5 min. Seed of Vasey grass (*P. urvillei*) and carpet grass (*Axonopus affinis*) germinated readily without treatment, and all scarification treatments reduced the viability of the seed of these species.

A machine facilitating acid scarification of rather large quantities of seed is described.

Pennsylvania weeds, E. M. GRESS (*Pa. Dept. Agr. Bul. 558* (*1938*), *pp. 39*, *figs. 17*).—A revision of the publication noted earlier (E. S. R., 55, p. 740).

Effectiveness of contact sprays in the control of annual weeds in cereal crops, B. N. SINGH and K. DAS (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 3*, *pp. 200–208*).—In replicated experiments on control of annual weeds (E. S. R., 80, p. 481) in wheat by sulfuric acid, ammonium thiocyanate, and copper sulfate sprays, degree of control differed with weeds and herbicides. *Anagallis arvensis* and *Euphorbia dracunculoides* were killed out more than *Chenopodium album*, explainable on morphological peculiarities and the relative hardiness of the weeds and quantity of spray solution adhering on the surface. The herbicides were effective in the decreasing order mentioned. Factors apparently contributing to the effectiveness of treatment were concentration of the herbicides, time of application, stage and development of the plants, leaf area exposed, and temperature and humidity of the atmosphere. Grain yield tended to increase with a reduction in weed density. Spraying with a higher concentration of ammonium thiocyanate solution gave better results due to addition of extra nutrients besides elimination of weed competition. Sulfuric acid spraying did not have a significant souring effect on the soil.

The control of nut grass with chloropicrin, G. H. Godfrey. (Tex. Expt. Sta.). (*Soil Sci., 47 (1939), No. 5, pp. 391–395, pl. 1*).—Treatment of infested soil at Weslaco, Tex., with chloropicrin at rates of from 400 to 750 lb. per acre, covering with mulch or Kraft paper or wet soil, gave practical control of nutgrass (*Cyperus rotundus*). Cost per 100 sq. ft. approximated $1 for chloropicrin and a few cents for gas-proof paper for cover. This method is deemed practicable for small gardens, flower beds, and small infestations, but probably will be too expensive on large-scale field application, where the tillage method of Smith and Mayton (E. S. R., 79, p. 190) is suggested. Since chloropicrin is deadly to plant life it must not be applied in the vicinity of living shrubs or trees in garden or flower beds. Its lethal effects on injurious insects, nematodes, fungi, etc., have been noted (E. S. R., 73, pp. 57, 201; 75, p. 638).

HORTICULTURE

[**Horticultural studies by the Alaska Station, 1937**] (*Alaska Sta. Bul. 7 [1938], pp. 18, 19, 26, 27, 30, 31, 33–35*).—Among studies the progress of which is discussed are the selection and propagation of native blueberries, currants, and raspberries; testing of small fruit varieties; propagation of ornamentals; and varieties of canning peas and other garden vegetables, annual flowers, and other plants.

[**Horticulture at the Georgia Coastal Plain Station, 1937**] (*Georgia Coastal Plain Sta. Bul. 29 (1938), pp. 32, 80, 84–92, 93–115, 132–137, figs. 2*).—Herein are presented progress statements on variety tests with tomatoes, watermelons, snap beans, asparagus, sweet corn, lettuce, and other vegetables, peaches, grapes, figs, strawberries, jujubes, blueberries, and citrus and other fruits; fertilizer studies with tomatoes, watermelons, lima beans, cabbage, and lettuce; cultural studies with tomatoes and lima beans; and adaptability tests with tung-oil trees, chia, and perilla.

[**Vegetable and flower variety trials, 1935–38**], W. B. Mack, E. M. Rahn, G. J. Stout, F. W. Haller, E. I. Wilde, C. E. Hoxsie, and L. M. Steinitz (*Pennsylvania Sta., Jour. Ser. Papers 799 (1937), pp. [11], figs. 2; 802, pp. [11]; 803, pp. [12]; 806, pp. [11]; 816 (1938), pp. [14], figs. 63; 821, pp. [7]; 822, pp. [9]; 825, pp. [23]; 870, pp. [11]; figs. 59; 871, pp. [7]; 872, pp. 8; 875, pp. [33]; 877, pp. 7; 879, pp. 7; 881, pp. 4; 882, pp. 5; 885 (1939), pp. 9*).—Herein are included mimeographs on the following subjects: Celery, 1937, beets, and carrots, 1936–37; cabbage, 1936–37; sweet corn, 1937; peas, 1937; beans, 1937; peppers, 1935–37; petunias, 1937; peas, 1938; beets, carrots, onions, and radish, 1938; petunias, 1938; tomatoes, 1938; cabbage and cauliflower, 1938; beans, 1938; peppers, eggplant, and summer squash, 1938; and sweet corn, 1938.

[**Horticultural investigations by the Western Washington Station**], C. D. Schwartze, G. A. Huber, and W. J. Clore. (Partly coop. Wash. Expt. Sta. and U. S. D. A.). (*Western Washington Sta. Rpt. 1938, pp. 25–27*).—Brief comments are offered on the progress of investigations in raspberry, blackberry, and strawberry breeding; varieties of vegetables for freezing preservation; and varieties of fruits and nuts.

Snap bean production in South Carolina, J. M. Jenkins, Jr. (*South Carolina Sta. Cir. 59 (1939), pp. 16, figs. 5*).—Consisting for the most part of general information relating to the extent of the industry, varieties, cultural requirements, fertilizers, control of insects and diseases, and harvesting, certain data are included that show that the use of 30 lb. of available N, 100 lb. of available phosphoric acid, and no K has given the most profitable yields. The use of from 50 to 100 lb. of available K significantly reduced the yields as compared with no K. The harmful effect of K is ascribed to an accumulation from several

years of intensive fertilization. Fertilizers having all the N in water-soluble form gave as good yields as those in which from 20 to 50 percent of the N was in water-insoluble form. The need of including Mn and Mg in the mineral fertilizer is stressed.

Directions for spraying fruits in Illinois, W. P. FLINT and H. W. ANDERSON (*Illinois Sta. Cir. 492 (1939), pp. 32, figs. 6*).—General information is presented.

Fall fertilization of peach trees in the Sandhills, C. F. WILLIAMS (*North Carolina Sta. Bul. 321 (1939), pp. 15, figs. 3*).—Based on studies with bearing and young trees it was found that N from nitrate of soda was assimilated by the roots of peach trees during the dormant season if the temperatures were above freezing, but was not translocated to the above-ground parts unless temperatures were above 45° F. Although nitrate applied to bearing trees in November and December produced a response in growth and yield approximately equal to the same rates of application in March, reserves in the tree were not increased before February unless the nitrate was applied in August or October. Longer terminal growth and larger yields resulted if the trees went into the dormant period in relatively high N condition, but fewer buds per shoot resulted unless the trees also had an application of N in March. The data suggested the need of good nutritional conditons throughout the season rather than heavy fertilization at any one time. Available nutrients were as important after the period of length growth and harvest in creating food reserves in the trees as they were in early spring for producing length growth. Postharvest applications of nitrate did not encourage late growth but did tend to avoid premature dormancy and thereby increased the resistance of the trees to winter injury. Postharvest applications of nitrate provided N for the winter period, but a fertilizer program including more slowly available materials applied in spring and early summer should be just as effective under most conditions. The use of cover crops is suggested as a means of providing a more constant supply of nutrients.

Nitrogen fertilization of bearing Elberta peach trees in the Sandhills, C. F. WILLIAMS (*North Carolina Sta. Bul. 322 (1939), pp. 24, figs. 4*).—To Elberta trees 8 yr. old at the beginning of the 5-yr. study and uniformly treated with respect to P and K and growing on a sandy soil containing little humus and low in native fertility and moisture-holding capacity, N in the form of nitrate of soda was applied in different amounts at different seasons and in single and split applications. During the 5-yr. experiment yields decreased each year on all treatments, and after the second year were unsatisfactory. In the first season, increases in the rate of nitrate application increased yields, but after the initial year the differences in yield between 3 and 6 lb. of nitrate per tree were small. The first year yields and growth increased with earliness of applications, but in the succeeding years the highest yields were often secured with treatments including an application after harvest. Apparently, postharvest treatments tended to delay leaf fall and dormancy and thus decreased the response of the trees to warm weather during the winter. Postharvest applications resulted in a high nutritive condition during the fall and winter and resulted in greater terminal growth the following year. Differential N treatments affected the rate of terminal growth but not at the time of its occurrence. There was no effect of the different treatments on the time of bloom. Increasing the total amount of nitrate applied before harvest tended to delay fruit maturity. Winter injury occurred only in trees of an extremely low nutritive condition. On the whole, it appeared that a more or less constant supply of nutrients was more desirable than heavy N fertilization at any one time.

Orchard and forest trees (*Nebraska Sta. Cir. 60 (1939), pp. 39–43, figs. 2*).—The station work with tree fruits and windbreaks is briefly reviewed.

Blueberry culture in Massachusetts, J. S. Bailey, H. J. Franklin, and J. L. Kelley (*Massachusetts Sta. Bul. 358 (1939), pp. 20, figs. 12*).—For the most part this includes general information on cultural requirements, propagation, pruning, control of insects and diseases, harvesting and marketing, etc. Studies in the improvement of wild high-bush varieties showed that the removal of competing trees and vegetation increased the growth of blueberry bushes. Pruning, where not excessive, increased growth and yields. Fertilizers, particularly N, increased growth and yields, the latter mostly from an increased number of fruits per plant. Fertilized bushes showed a marked tendency to annual bearing, and the berries on fertilized plats were firmer during dry periods. A combination of fertilization and pruning was much more effective than either alone. Any treatment that increased terminal shoot growth up to about 10 in. increased yield. Above 10 in. the growth tended to become overvegetative.

FORESTRY

A method of marking trees, J. D. Curtis. (Mass. State Col.). (*Jour. Forestry, 37 (1939), No. 3, pp. 246–249, figs. 3*).—The author discusses the use of wooden nails made of bamboo or other material for marking trees.

Measurement of precipitation above forest canopies, W. E. Davis. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 4, pp. 324–329, figs. 4*).—Stating that the amount of precipitation intercepted by forest canopies has been estimated by various investigators to be from one-fifth to one-third of the total rainfall, the author presents a method for measuring the rainfall at the tree crown surfaces. By the use of a simple hoist device mounted at the end of a pole the gage could be raised or lowered from the ground to the crown-surface position.

Transpiration of trees and forests, L. S. Minckler. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 4, pp. 336–339*).—Based on measurements on large forest trees growing in their natural habitat in New York State, transpiration in acre-inches is estimated to range from 4.72 to 17.02 for red maple, from 1.52 to 7.37 for American elm, and from 2.35 to 7.87 for white pine. Sugar maple and beech lost 3.04 and 2.98 acre-in., respectively. Current transpiration is influenced by light intensity, relative humidity, time of day, and season.

Density of stocking and character of ground cover as factors in longleaf pine reproduction, L. J. Pessin. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 3, pp. 255–258, figs. 2*).—In a dense natural stand of 12-year-old longleaf pine seedlings still in the grass, plats denuded in 1932 of all vegetation except the pine showed greater height development in the next 5 yr., regardless of the density of the stand, than where the grass was not removed. In the grassy plats the maximum growth occurred in the plat with 1,000 seedlings per acre, but height growth was only one-third that of the denuded area. The favorable effect of grass removal is believed to result form release from root competition for nutrients and at times for water.

The release of seeds from jack pine cones, R. K. LeBarron and F. H. Eyre. (U. S. D. A. and Univ. Minn.). (*Jour. Forestry, 37 (1939), No. 4, pp. 305–309, figs. 3*).—Having shown in an earlier report (E. S. R., 80, p. 777) that midsummer heat is a potent factor in releasing seed from cone-bearing slash, the authors compared the amount and time of seed fall from jack pine cones attached to slash, felled trees, and girdled trees. During a period of 29 mo., the cones of the lopped branches yielded 9 times as many seeds as the felled trees and 100 times as many as the girdled trees. The slash cones released

25, 68, and 7 percent of the seed, respectively, in the first, second, and third years. The girdled and the felled trees released practically no seed the first year. July and August were the months of maximum release each year, with smaller amounts released in June, September, and October.

Testing germination in sand, A. A. DUNLAP and A. D. McDONNELL. (Conn. [New Haven] Expt. Sta.). (*Jour. Forestry, 37 (1939), No. 4, pp. 330–332, fig. 1*).—A method which involves the use of partially sterile sand continuously supplied with moisture by subirrigation is described. With the device there were secured germination percentages of forest seeds practically equal to or higher than those obtained in soil or in oven germinators. In addition, there was less tendency to decay.

The phosphate and potash starvation of forest seedlings as a result of the shallow application of organic matter, S. A. WILDE and R. WITTENKAMP (*Jour. Forestry, 37 (1939), No. 4, pp. 333–335, figs. 3*).—Evidence is presented to show that top dressings of organic matter discourage the downward movement of the roots, thereby preventing their securing adequate supplies of other nutrients, chiefly phosphate and K, occurring in the soil at greater depths. In field practice it is suggested that prior to planting the seed or seedlings a considerable portion of the peat or duff should be incorporated in the soil by alternate plowing and disking or rototilling.

Relation of the root system of a sprouting stump in Quercus montana Willd. to that of an undisturbed tree, O. M. WOOD. (U. S. D. A. et al.). (*Jour. Forestry, 37 (1939), No. 4, pp. 309–312, fig. 1*).—In studies conducted in an experimental forest in the New Jersey Coastal Plain, excavation of the roots of two trees, one dug directly and the other in September of the season following cutting, indicated that a portion of the root system dies shortly after the parent tree is cut. The sprouts developing in the year following cutting had a leaf area of about 13 percent of that of the parent tree.

The effect of spacing on the growth of Norway pine plantations—a progress report, D. D. STEVENSON and R. A. BARTOO. (Pa. Expt. Sta.). (*Jour. Forestry, 37 (1939), No. 4, pp. 313–319, fig. 1*).—Observations on the development of Norway pines planted in the spring of 1921 at intervals of 5 by 5, 6 by 6, 6 by 8, and 10 by 10 ft. showed in 1937 that crown closure had occurred on all but the 10- by 10-ft. plat. Natural pruning up to a height of 8 ft. had occurred on the 5- by 5-ft. plat, with practically none on the 10 by 10. On the 10 by 10 trees branch diameters were over 50 percent larger than on the more closely planted, had made the most rapid growth during the 17 yr., and were the tallest, with little difference in height between the trees on the other three plats. The average form quotient of the 10 by 10 trees was considerably lower than that of the other trees.

A design for experiments in thinning forest stands, J. G. OSBORNE. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 4, pp. 296–304, fig. 1*).—This paper presents with discussion and elaboration an experimental design which is intended to increase the amount and accuracy of information obtained from thinning investigations.

An experiment in the use of sodium arsenite in thinning ponderosa pine, B. R. LEXEN. (U. S. D. A. and Univ. Ariz.). (*Jour. Forestry, 37 (1939), No. 3, pp. 259–262*).—The injection of sodium arsenite solution into holes bored into the trunks of ponderosa pines was found effective in killing the trees. In the case of over 700 trees ranging from 4 to 18 in. in diameter poisoned over a period of 3 yr., in no instance did bark beetles enter the cambium. Common wood borers entered the year following poisoning but preferred areas not reached by the ascending arsenite of soda.

Hardwood brush disposal in the Hudson highlands, H. H. TRYON (*Black Rock Forest Papers, 1 (1938), No. 12, pp. 81–86, figs. 4*).—Of four methods of handling brush, lopping and scattering was the most effective for hastening decay but interfered with the hauling of wood from the forest. Large piles of brush were observed to be slow to decay except at the ground level. The most efficient procedure was to make small shallow piles, none over 2.5 ft. high. After two summers such piles were usually so well rotted that the fire hazard was materially reduced. Practical suggestions are included.

Forest fires in Ohio, 1923 to 1935, B. E. LEETE (*Ohio Sta. Bul. 598 (1938), pp. 54, figs. 21*).—Information is presented on the location and organization of the forest fire districts, number and size of fires, damage caused, cost of suppression, causes of fires, etc.

DISEASES OF PLANTS

The Plant Disease Reporter, May 1 and 15, 1939 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 23 (1939), Nos. 8, pp. 129–139; 9, pp. 141–157, figs. 4*).—The following are included:

No. 8.—Noteworthy Florida and Georgia fungi, by V. K. Charles; notes on the occurrence of *Coleosporium crowellii* Cummins in the United States, by G. G. Hedgcock; notes on *Coleosporium crowellii*, by J. Dearness; further reports on apple scab, for Massachusetts, Rhode Island, and New York (Hudson Valley); some reports on diseases of cereals, including rusts in Texas and powdery mildew on barley in California; *Macrophomina phaseoli* on *Strophostyles helvola* in Georgia, by H. W. Johnson; and brief notes on dodder on tomato in Texas, drop of lettuce and other lettuce diseases in North Carolina, and tobacco downy mildew appears in Virginia.

No. 9.—Relative prevalence and geographic distribution of various ear rot fungi in the 1938 corn crop, by P. E. Hoppe; early appearance of crown rust of oats in Arkansas in 1939, by H. R. Rosen; rusts and loose smut on small grains in Texas, wheat leaf rust in Kansas, wheat leaf rust in Iowa, and leaf rust on wheat and barley in Kentucky; apple scab development in Rhode Island, New York, Delaware, and Illinois; some reports on diseases of peach, including the general prevalence of scab infection on peach twigs, scab on peach twigs in New York, brown rot and frost injury in Delaware, and peach leaf curl in Illinois; red stele of strawberry in Kentucky, pear scab in New York, development of cedar rusts in New York, and blight injury to pears from last year in New York; reports on tobacco diseases, including tobacco downy mildew in Virginia, downy mildew and wildfire in Maryland, and tobacco diseases in Kentucky; late blight of potato on the Eastern Shore of Virginia, by H. T. Cook; and *Ceratostomella* (*Endoconidiophora*) on planetrees, by M. E. Fowler.

[Plant disease studies by the Georgia Coastal Plain Station]. (Partly coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 29 (1938), pp. 10, 11, 92, 93, 115–119, 125–130, figs. 3*).—Brief reports on the following are included: Control of root knot nematode on tobacco and other crop plants by nematocides, resistant sorts, and cultural practices; tomato disease studies with special reference to *Macrosporium;* and tobacco diseases, including downy mildew control by spraying and cultural practices, damping-off (*Rhizoctonia* and *Pythium*), sore shin (*Sclerotium rolfsii* and *Rhizoctonia* sp.), frog-eye leaf spot (*Cercospora nicotianae*), Granville bacterial wilt, *Fusarium* wilt, black shank (*Phytophthora parasitica nicotianae*), and mosaic.

Department of plant pathology (*Western Washington Sta. Rpt. 1938, pp. 27–32*).—Brief reports of studies are included with reference to bulb diseases, by

G. A. Huber:[6] brown rot of stone fruits, and raspberry mosaic and its vectors (E. S. R., 78, p. 210; 80, p. 504), both by Huber and K. Baur; crown gall of blackberry, by Baur and Huber; stem rot (*Botrytis*-type organism) of poinsettia, by Huber; bronzing and dwarfing of hops, alfalfa bronze top, raspberry rust, crumbly fruit in raspberries, and black tip of rhubarb, all by Baur and Huber; canker and gall disease of gardenia, by Huber; late blight of potato, by Huber and Bauer; and club root of crucifers, by Baur and Huber.

Infection of tomato and red clover with conidia of Pleospora lycopersici and Macrosporium sarcinaeforme, J. T. MIDDLETON. (Univ. Calif. and Univ. Mo.). (*Phytopathology, 29 (1939), No. 6, pp. 541–545, figs. 2*).—On inoculation, conidia of *P. lycopersici* were found capable of infecting leaves and flowers of tomato, while negative results were obtained on red clover, white clover, alsike, alfalfa, and white sweetclover. On the other hand, conidia of *M. sarcinaeforme* proved capable of infecting various leguminous plants on inoculation, but no infection was obtained on tomato. Differences in the cultural characters as well as in the pathogenic powers of these two fungi are considered prohibitive to the application of the binomial *M. sarcinaeforme* to the imperfect stage of *P. lycopersici*.

Plant viruses, I, II (*Tab. Biol., 16 (1938), No. 4, pp. 355–371, figs. 4; 17 (1939), No. 1, pp. 24–71*).—Two papers are included:

I. *Serological, chemical, and physico-chemical properties*, F. C. Bawden and N. W. Pirie.—This is a conspectus of present knowledge, with tabulations, and virus groupings according to various properties.

II. *Virus diseases of plants*, K. M. Smith.—This is an annotated tabular list of plant viruses alphabetically arranged by hosts, with insect vectors and other transmission methods, differential hosts, chief symptoms, main host plants, distribution, control, and literature references indicated for each. There is also a general bibliography.

The intracellular inclusions of some plant virus diseases, F. C. BAWDEN and F. M. L. SHEFFIELD (*Ann. Appl. Biol., 26 (1939), No. 1, pp. 102–115, pls. 2*).—"The contents of healthy cells and those infected with a number of different plant viruses are described. Some of these viruses apparently do not cause the production of intracellular inclusions; others cause the production of amorphous bodies only, and the remainder produce both amorphous and crystalline inclusions. The properties of the inclusions are compared with those of purified preparations of the viruses. It is shown that insoluble complexes of the viruses with protamines, histones, and proteins which in many ways resemble the intracellular inclusions can be produced in vitro. Possible explanations for the formation and disappearance of the inclusions in infected plants are suggested."

Transmission of plant viruses by insects, H. H. STOREY (*Bot. Rev., 5 (1939), No. 4, pp. 240–272*).—Following an introductory discussion, this critical review (90 references) of transmission by leaf-sucking insects treats the subject matter under the headings: How the vector obtains the virus, how the vector carries the virus (with transmission negative on first hosts and positive on succeeding hosts, and the reverse), and how the vector inoculates the virus.

Injuries to plants caused by insect toxins, W. CARTER. (Hawaii. Pineapple Producers' Expt. Sta.). (*Bot. Rev., 5 (1939), No. 5, pp. 273–326*).—This comprehensive review (257 references) concerns those plant toxemias induced by insect secretions toxic to the plant cell but not increasing within plant tissues and distinct from damage arising from traumatic injury incident to insect feeding. Except for the gall formers, which include species in several

[6] Florists' Rev., 79 (1937), No. 2045, p. 21.

orders, all the forms referred to here are sucking insects belonging to the Homoptera or Hemiptera. The voluminous data are discussed under leaf-spotting forms, toxic effects of feeding by Miridae (Capsidae), tissue derangements by the Aphididae, insect galls, hopperburn, froghopper blight, psyllid yellows of potato and tomato, and mealybug wilt of pineapples.

Physiological relations between host and parasite in crown gall: An example of basic biological research with plant materials, A. J. Riker. (Wis. Expt. Sta.). (*Amer. Jour. Bot., 26 (1939), No. 3, pp. 159–162, figs. 3*).—The author enumerates the advantages of plants over animals as objects for basic research on cellular pathology, and summarizes the high points, particularly of his own studies directed towards determining the mechanisms whereby bacteria stimulate the infected plant to hypertrophy and hyperplasia. His discussion of the crown gall topic is considered under its bacteriological, biochemical, and physiological aspects, and both factual and theoretical data are included.

Some factors affecting the susceptibility of plants to fire blight, H. E. Thomas and P. A. Ark (*Hilgardia [California Sta.], 12 (1939), No. 4, pp. 299–322, figs. 2*).—Histological observations on shoots of resistant v. susceptible plants in general supported earlier workers in indicating that the size of intercellular spaces is a minor factor in determining the course of infection. Tissues known to be high in N were in general more susceptible than the nearest comparable tissues of lower N content. The evidence suggests that the concentration of solutes in the nectar and perhaps also in the plant sap as affected by atmospheric humidity is important in the penetration by *Bacillus amylovorus* (=*Erwinia amylovora*) and in the development of infection. On the trunks of girdled pear and apple trees, the bark immediately above proved more susceptible than that immediately below. Slight wounds 2–4 in. below the points of inoculation of susceptible shoots failed to cause marked change in the development of infection. Gums and suberins were not detected at the margins of wounds until after the period during which the wounds would be susceptible. Etiolation had a relatively slight influence on infection, while defoliation definitely reduced susceptibility. In the progeny of a hybrid of *Pyracantha angustifolia* and *P. gibbsii yunnanensis*, resistance seemed to be at least partially dominant. In the F_2 generation no relation was observed between susceptibility and parental resemblance. Forty-four references are included.

Studies on variation in Gibberella saubinetii (Mont.) Sacc. (Fusarium Graminearum Schwabe), M. Goddard (*Ann. Missouri Bot. Gard., 26 (1939), No. 2, pp. 99–164, pls. 8, figs. 2*).—After growing a number of conidial isolates of two strains for several generations on potato-dextrose agar, only one permanent variant was formed in one strain and two in the other. When nine conidial isolates, including the three variants, were grown on Brown's, Coons', Richards', Leonian's and potato-dextrose agar at 18°, 20°, 25°, and 30° C., ecovariants, as well as some permanent variations, were produced. More variations of both kinds and best growth occurred at the lower temperatures and on Leonian's agar. Optimum temperature was 25°. Subjected to variations in media and temperature, mycelial and conidial forms were only fairly constant. The pionnotal stage in one strain reverted to the aerial mycelial stage, which seemed to answer the description of the original ascospore isolate from corn stubble. It completed a cycle of growth by passing from the aerial mycelial phase through the conidial and appressed phase, through the pionnotal phase back to the aerial mycelial phase. No new or intermediate strains resulted from crossing morphologically different strains. There was no evidence of caryogamy in the hyphal anastomoses. Production of two sectors at about

the same time and identical mutant sectors favor the theory that the saltation was somatic rather than germinal. Nearly four pages of bibliography are included.

Distribution and prevalence of Ozonium root rot in the shelterbelt planting area of Oklahoma, G. L. Peltier, F. R. Schroeder, and E. Wright. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 6, pp. 485–490, figs. 3*).—Using methods previously described (E. S. R., 77, p. 345), the authors found that the western limit of *Phymatotrichum omnivorum* root rot infestation extends somewhat beyond the 99° meridian, the northern limit just south of the Wichita Mountains, the eastern limit beyond the planting area, and the southern limit across the Red River into Texas. A relationship appeared to exist between infested areas and certain watersheds and drainage basins of the larger rivers. Since much of the success of tree planting in the Southwest depends on the previous location of root rot-infested areas, the U. S. D. A. Forest Service can, on the basis of the information obtained, now safely make shelterbelt plantings either by avoiding infested lands or by using resistant tree species on infested soil.

Unusual features in the behavior of sclerotia of Phymatotrichum omnivorum, J. T. Presley. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 6, pp. 498–502, figs. 2*).—After reviewing briefly the previously known stages (vegetative, sclerotial, and conidial) of the fungus, the author reports that, in contrast to the usual development of reproductive structures from primordia located just beneath the rind of sclerotia, in the *Phymatotrichum* sclerotium every cell seems capable of reproduction. However, these cells have never been seen to germinate and give rise to reproductive structures. Instead, a sterile mycelium is produced by "vegetative sprouting," which continues as long as any part of the sclerotium remains viable. Detailed study indicated that the new hyphae do not arise as branches or elongations of the resting cells, but appear to be formed within the cells, whose contents appear to go through a process of disorganization and reorganization that results in the forming of new hyphae instead of sporophores. Each of these new hyphae is capable of developing into a mycelium. The sequence of events within the sclerotial cells, based on the material thus far observed, is described and illustrated in detail, but final conclusions as to their significance is reserved pending further cytological studies under way.

Studies of monosporous cultures of Septoria bromigena, J. L. Allison. (Minn. Expt. Sta.). (*Phytopathology, 29 (1939), No. 6, pp. 554–556, fig. 1*).—This is a preliminary report of studies of 200 monosporous lines of *S. bromigena* isolated (1937) from *Bromus inermis* collected in 4 Minnesota localities and grown on 12 culture media. Among them there were many consistently different cultural types falling into 4 groups corresponding to the locality from which isolated. The isolates from each locality differed from those of every other locality, while those from the same locality, though differing slightly, were very much alike. Sector variants appeared in some cultures of all lines, several distinct variants often developing in a single culture. Inoculated on susceptible strains of *B. inermis*, infection was obtained readily with conidial suspensions but none with macerated mycelial mat suspensions of 6 nonsporulating variants. Preliminary evidence indicates that *B. inermis* is the only susceptible one of 34 *Bromus* species tested, and that inbred lines of this species differ greatly in susceptibility.

Soil infestation by Ophiobolus graminis and its spread, H. Fellows and C. H. Ficke. (U. S. D. A. and Kans. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 7, pp. 505–519, fig. 1*).—The data presented from field and greenhouse tests indicate that any agency capable of moving soil particles or plant debris may

carry infestation, but that the establishment of take-all in a new location is slow and uncertain. *O. graminis* did not spread from infested to noninfested soils when such soils were placed in contact without mixing and no wheat roots were growing through the adjacent sections, but when roots grew through these sections in either direction the fungus spread to the noninfested soil. Infested soils placed in contact with noninfested soils often lost their infestation, and infestation often apparently disappeared from take-all spots in the field. Dead diseased host remains proved to be fairly good carriers in the greenhouse but not in the field. Ascospores were an excellent source of infection, but were seldom seen in the Middle West. Cultures of the fungus grown on sterilized barley-oat medium experimentally infested the soil in both field and greenhouse, and the soils remained infested a long time, but methods of soil infestation were more positive in greenhouse than in field tests. Infected roots of the living host are considered perhaps the most positive factor in carrying *O. graminis* to noninfested soil and in contributing greatly to its establishment. This explains the value of crop rotation in controlling take-all.

Summary of uniform spring-wheat bunt nursery, 1938, H. A. RODENHISER and J. A. CLARK (*U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. 3*).—This is a discussion and tabulation of the results obtained in 1938, together with averages for previous years.

Studies of the susceptibility of forage grasses to cereal smut fungi.—II, A preliminary report on Ustilago hordei and U. nigra, G. W. FISCHER. (U. S. D. A. and Wash. Expt. Sta.). (*Phytopathology, 29 (1939), No. 6, pp. 490–494*).—Three collections of a covered smut from *Agropyron cristatum* and *Elymus glaucus jepsoni*, morphologically identical to *U. hordei*, were inoculated into Beldi Giant and Trebi barley, along with one authentic collection of *U. hordei* from Beldi Giant. Monosporidial cultures of these collections were also crossed in all possible combinations and inoculated into the two barleys. Both varieties became smutted by each of the three grass collections of *U. hordei*, by the collection from Beldi Giant, and by all crosses among the collections. The collections on *Agropyron* and *Elymus* are therefore considered to be *U. hordei*. Of 25 species of grasses in the tribe Hordeae inoculated with the same 4 collections of *U. hordei*, 10–50 percent infection resulted on *A. caninum*, *E. canadensis*, *E. glaucus jepsoni*, *E. sibiricus*, *Hordeum nodosum*, and *Sitanion jubatum*. When the same 25 grasses were inoculated with *U. nigra*, 30–50 percent smut appeared on *E. canadensis*, *H. nodosum*, and *S. jubatum*. See also a previous note (E. S. R., 77, p. 639).

The Ustilaginales or smuts of Utah, A. O. GARRETT (*Utah Univ. Bul., 29 (1939), No. 9, pp. 23, pls. 4*).—This study, begun in 1902, is based on collections in the State—all by the author unless otherwise stated. It is presented as an annotated list, with a key to the genera and indexes to scientific names of both hosts and smut fungi.

Genetic and environmental factors affecting growth types of Ustilago zeae, M. F. KERNKAMP. (Minn. Expt. Sta.). (*Phytopathology, 29 (1939), No. 6, pp. 473–484, figs. 2*).—A (1) strict sporidial type, a (2) rather strict mycelial type, and (3) various intermediate types of growth were shown to exist. The first type could not be induced to develop mycelium by any of the means used, while the second type could be induced to form only a very few sporidia under certain conditions. Some of the intermediate types could be induced to become either sporidial or mycelial with proper environal relations. Increasing the amount of various nutrients in solutions, especially certain sugars, increased the sporidial growth in intermediate lines and to a much lesser extent in mycelial lines. Fresh supplies of nutrients increased the

sporidial growth in intermediate lines and to a much lesser extent in rather strict mycelial lines. Temperature, pH of the medium, and "staling" products had no effect on the growth types of the lines studied. In a sporidial × mycelial cross, segregation of factors for sporidial and mycelial growth types occurred on individual promycelia on a 4:0, 3:1, and 2:2 basis. The results appear to indicate two or more factors for both sporidial and mycelial types.

Dissemination of celery blight pathogens on the clothing of farm laborers, M. B. Linn. (Cornell Univ.). (*Phytopathology, 29 (1939), No. 6, pp. 553, 554*).—Observational and experimental evidence (1937) that spores of early and late blight due, respectively, to *Cercospora apii* and *Septoria apii* are disseminated on the clothing emphasizes the danger of walking through or cultivating celery fields when the plants are wet. Reported failures of some growers with fungicidal control practices may possibly be explained by these findings.

A survey of the spotted wilt disease of lettuce in the Salinas Valley, M. R. Harris (*Calif. Dept. Agr. Bul., 28 (1939), No. 3, pp. 201–213, figs. 2*).—The disease is described and its virus nature discussed. It is reported as having been noted on 43 species of 15 families (listed). The symptoms on hosts other than lettuce are also described, and various hosts are grouped according to relative susceptibility. A total of 44,924 acres of lettuce were planted in the Salinas Valley in 1938, and a summary of the amount of infection at various times during the year, the distribution of hosts, and the prevalence of spotted wilt on lettuce there are considered. As a result of this survey, the following suggestions are presented: Lettuce fields should be plowed or disked as soon as harvested, ornamental hosts in the vicinity should be eliminated, so far as practicable lettuce should be avoided in appreciably infected areas, lettuce should not be planted near pepper or tomato if it is to be harvested late in summer or fall, nor should it be planted in summer or fall on areas adjacent to ornamental hosts used for seed production, and old malva plants should be destroyed in cultivated areas and along roadsides. Thirteen references are given.

Chemical elimination of saprophytes during laboratory germination of seed peas, W. Crosier and S. Patrick. (N. Y. State Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 6, pp. 397–422*).—Of the various chemicals tested, dusts containing mercury compounds effectively controlled surface molds on pea seeds when properly used and without injury to the seedlings. The size and weight of the seedlings and the germination percentages were increased by Ceresan treatment. Copper and zinc compounds were less efficient fungicides and prevented normal radicle elongation. Sulfur, aldehydes, and ferrous sulfate failed to reduce the fungus-seed associations. Dip treatments with soluble mercury compounds eliminated molds as effectively as the dusts and gave a saving in time and material. A concentration of 0.18 percent for $HgCl_2$ or New Ceresan was an optimum dosage. Nonsoluble mercury, copper, and zinc compounds did not give a uniform coverage of the seeds. As to pathogens, *Rhizoctonia solani* and species of *Alternaria* and *Fusarium* were tolerant of all the chemicals studied, but ethyl mercury phosphate occasionally decreased the incidence of seeds infected by *Ascochyta pisi*. Elimination of *Rhizopus nigricans* permitted *Alternaria* spp. to develop rapidly and also made recognition of the latter easier. Testing the chemically treated peas in towels gave more exact germination data than untreated seeds widely spaced in pasteurized soil.

Disease resistant pea varieties, J. C. Walker. (Univ. Wis.). (*Canner, 88 (1939), No. 12, pt. 2, p. 89*).—Note on resistance, with special reference to wilt and near-wilt.

Controlling the peanut leaf spot, W. A. Jenkins. (Ga. Expt. Sta.). (*South. Seedsman, 2 (1939), No. 5, pp. 4, 17, 19, fig. 1*).—After summarizing previously noted points relating to the two *Mycosphaerella* leaf spots of peanut (E. S. R., 79, p. 350), the author adds data on reductions in yield and on control. Preliminary trials (1937–38) of sulfur dust (325-mesh) were encouraging, and progress is noted on development of resistant strains of peanuts.

The effects of some agronomic practices on the incidence of Rhizoctonia, F. M. Blodgett. (Cornell Univ.). (*Amer. Potato Jour., 16 (1939), No. 4, pp. 93–98*).—Although these potato rotation experiments have been in operation for only 3 yr., certain definite results are reported. When potatoes were grown on the same plats for 3 successive years, more *Rhizoctonia* occurred on the tubers than during the longer rotations, but use of 1,000 lb. of a 5–10–5 fertilizer reduced the number of tubers bearing *Rhizoctonia* in the two places where this point was tested. Stable manure also reduced the amount of *Rhizoctonia* on the tubers in all of the places, and a rye cover crop in two of three places. Where potatoes were grown repeatedly on the same plats, the best control was obtained by combining commercial fertilizer, stable manure, and cover crops.

Notes on the photoperiodic reactions and virus contents of some Peruvian potatoes, R. W. G. Dennis (*Ann. Appl. Biol., 26 (1939), No. 1, pp. 87–101, pls. 2*).—Exposure of 59 Peruvian potato varieties to full summer day at Cambridge, England, resulted in a more uniform growing period and increased the blooming tendency, but the effect on tuber production varied according to the variety. In most types the weight and number of tubers were not adversely affected, but there was a tendency to elimination of the dormancy period and to conversion of the stolons into aerial shoots. In a few varieties there was no adverse influence, and in one small group the plants exposed to full-day conditions formed no tubers. Study of the virus content indicated only 11 of the 59 varieties to be healthy, in those remaining there being found viruses apparently identical with those known in England as X, B, C, F, G, and perhaps leaf roll. There was also evidence of other viruses, suggesting the existence in America of a virus complex, only isolated members of which have hitherto been known in Europe. Great caution is therefore recommended in introducing South American varieties into potato-growing districts.

Soft rot of pumpkin and watermelon fruits caused by Pythium ultimum, C. M. Tompkins, P. A. Ark, C. M. Tucker, and J. T. Middleton. (Calif. and Mo. Expt. Stas.). (*Jour. Agr. Res.* [*U. S.*], *58 (1939), No. 6, pp. 461–475, figs. 3*).—The soft rot of Zucchini and Mammoth Summer Crookneck pumpkin and watermelon fruits, described as prevalent in California and due to *P. ultimum*, occurs when fruits are in contact with wet soil and is favored by cool weather. The symptoms are described. Invaded fruits may be completely rotted 6–10 days after infection. Certain cucurbit isolates of the fungus, indistinguishable from normal cultures by growth or pathogenic characters, failed to produce oospores, though reproductive bodies resembling oogonia developed in culture. It is suggested that the absence of oospores results from failure to develop antheridia. A minimum of 4° C., an optimum of 25°–28°, and a maximum of 40° were determined for the fungus. All cucurbit isolates and those from roots of alfalfa, tobacco, and spinach, and a culture from an unknown host, had identical temperature relations. Infection of healthy pumpkin and watermelon fruits was obtained by laboratory inoculations, but wounding of watermelon fruits was necessary in order to induce decay. All isolates caused damping-off of pumpkin, watermelon, and tomato seedlings, but older plants were resistant. In the laboratory, green and ripe

tomatoes, eggplant, beans, and field pumpkin proved susceptible to infection without wounding. When wounded, apple, bell pepper, squash, pumpkin (two varieties), watermelon, melons (Casaba, Honey Dew, and Persian), cucumber, turnip, rutabaga, carrot, parsnip, potato, lemon, sweet orange, onion, and *sweetpotato* all proved susceptible.

Pathology, J. P. MARTIN (*Hawaii. Sugar Planters' Assoc. Proc., 58 (1938), Expt. Sta. Com. Rpt., pp. 30–38*).—A review and brief notes on approved projects are presented, including quarantine against foreign plant diseases, especially those of sugarcane; plantation inspection and consultation services; cane diseases in Hawaii, including brown stripe, mechanical injuries, chlorotic streak, lightning injury, *Helminthosporium sacchari* eyespot disease, *Bacterium albilineans* leaf scald, stem galls and their insect relations, mosaic, and growth failure and *Pythium* root rot; physiological disorders of sugarcane, including the relations of nutritional factors and growth-promoting substances; and chromosome studies of sugarcane, with special reference to colchicine effects.

The behavior of POJ 2878 sugar cane in relation to Fiji disease and transmission of the virus by nymphs of Perkinsiella vastatrix, G. O. OCFEMIA and M. S. CELINO (*Phytopathology, 29 (1939), No. 6, pp. 512–517, fig. 1*).—The results of this study indicated that among apparently healthy stalks of the P. O. J. 2878 variety selected from a field, two produced shoots some of which were infected with Fiji disease while the others were disease-free. The shoots not showing symptoms of the disease proved to be virus-free. When the apparently healthy shoots arising from the two infected stalks were used in transmission tests they became readily affected with Fiji disease. Besides the adults of *P. vastatrix*, the second, third, fourth, and fifth instar nymphs were shown to be capable of transmitting the Fiji disease virus, but nymphs hatching from eggs of viruliferous leafhoppers did not carry the virus. Viruliferous adults required at least 24 hr. to elapse before they could transmit the disease.

Comparative study of sugarcane mosaic from different countries, J. MATZ. (U. S. D. A.). (*Internatl. Soc. Sugar Cane Technol. Cong. [Baton Rouge, La.], Proc., 6 (1938), pp. 572–580, figs. 2*).—Comparative studies (since 1935) of virus strains from the United States, Puerto Rico, islands of the Pacific, India, and Spain have shown through use of differential hosts the existence of distinct virus types. Sugarcane B. H. 10 (12) has proved to be a most receptive variety to the several available Louisiana and Puerto Rico mosaic virus strains, and with respect to a Hawaiian virus it also served to establish the fact that this virus possesses the property of transmissibility, though in a restricted varietal range. The observations and tests indicate clearly that the mosaic strain from Hawaii used is innocuous to the C. P. 28/60, C. P. 31/294, and Co. 281 cane varieties, which are susceptible to the more prevalent virus strains in North America and Puerto Rico. These studies further indicate that in Tahiti, New Caledonia, and Hawaii there exist mosaic virus strains that are less virulent and more difficult to transmit to varieties that are highly susceptible to the prevalent strains in the United States. The P. O. J. 36 variety was one of the first mosaic-infected canes introduced from Java into Puerto Rico (via Tucuman), and B. H. 10 (12) has been the most widely cultivated variety there in recent years. The virus strains obtained from Puerto Rico on each of these varieties are apparently identical, and are said to be similar to the moderately severe, highly infectious, stable virus 1-B Summers (formerly strain II Louisiana), and to strains from Spain and India. It is deemed fairly conclusive that the four out of five strains from certain Pacific islands have so far proved

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to be less infective than the principal types of our common cane mosaic viruses at the present time.

Frenching of tobacco, E. L. Spencer and G. I. Lavin (*Phytopathology, 29 (1939), No. 6, pp. 502, 503*).—The authors report spectrographic analyses of greenhouse Turkish tobacco grown in field and composted soils and in sand with and without added $TlNO_3$ to test the theory that frenching is due to the toxic action of thallium. The data obtained suggested that frenching and known Tl injury are two distinct physiological diseases. However, if the two are due to different agents, it is noted as surprising that the top and root symptoms and the methods of control are so similar. Furthermore, a water extract of nontoxic soil, collected near a natural frenching area, did not produce frenching until supplemented by the additive effect of a nontoxic amount of Tl. It is suggested as not improbable that the toxic action of Tl may be exerted on the root, giving rise to some disturbance affecting the top, and that possibly the Tl compound in the soil may be in a form not so readily translocated into the top as the salt used in the experiments. If this were true the spectrographic detection of Tl only in plants treated with $TlNO_3$ would not necessarily eliminate thallium as the cause of frenching.

On the molecular weight of the tobacco-mosaic virus protein, V. L. Frampton. (Cornell Univ.). (*Phytopathology, 29 (1939), No. 6, pp. 495–497*).—The author points out the limitations in applicability of the laws of Fick, Pouiselle, and Stokes to sols of this virus protein in water or phosphate buffer for the determination of the particle weight, with the conclusion that the laws enunciated by the first two are not followed by these sols but that Stokes' law is valid for the material in question.

Symptoms of yellow ring spot and longevity of the virus in tobacco seed, W. D. Valleau. (Ky. Expt. Sta.). (*Phytopathology, 29 (1939), No. 6, pp. 549–551*).—It was found that this tobacco virus could be transmitted through the seed from generation to generation without the formation of ring patterns, i. e., with general leaf-edge chlorosis (yellow strain) symptoms and pollen sterility as the chief signs of the infection. The ring and line patterns are said to be inoculative and invasive symptoms. The survival time found for the virus was 5½ yr.

Root-knot nematode of tomatoes in relation to the Indiana canning crop, G. A. Ficht (*Indiana Sta. Bul. 434 (1939), pp. 15, figs. 8*).—As an important pest of canning tomatoes in Indiana, nematodes are said to occur primarily in fields set to plants originating in the South. Infestation was found to produce important effects on the yield of canning fruits, the amount set being reduced and the size being smaller, with the consequent lowering of quality of some types of pack. The decreased income to growers from this pest has amounted to as much as $32 per acre on the conservative basis of $12 per ton for U. S. No. 1 and $7 per ton for No. 2 canning fruits. No evidence has been obtained for the winter survival of *Heterodera marioni* in the open in northern Indiana, though it has been known to live over in Ohio and New York. Rotations are therefore advised to include corn, wheat, oats, sweetclover, grasses, or other resistant hosts, and tomato plants should be examined for infestation before setting out.

Factors affecting development of the bacterial canker of stone fruits, E. E. Wilson (*Hilgardia [California Sta.], 12 (1939), No. 4, pp. 257–298, figs. 9*).—Criteria were developed to determine rise and fall in activity of the cankers induced by *Phytomonas cerasi*, by which it was seen to begin in late fall, continue through winter and spring, and halt in early summer, bacterial fluctuations in affected tissue accompanying this rise and fall in canker activity.

By successive inoculations (nearly 2 yr. and principally on plum), it was found that the fall period when they were successful corresponded with the period of activity of spontaneous cankers, while the spring period when inoculations failed to take agreed with the time when established cankers ceased activity. Low temperatures in midwinter were correlated with decreased canker extension, whereas rises in temperature in spring were accompanied by increased extension, but failure of inoculations in early fall and early summer was apparently not due to adverse temperatures. Moderately diseased trees on sandy loam were benefited by $(NH_4)_2SO_4$ fertilization, seemingly from an enhanced ability to repair damage by the disease. The results of controlled soil moisture tests are interpreted as indicating that a lack of available moisture affects the disease adversely, whereas wide differences short of actual lack of available moisture did not appear to influence the disease. The severity of the disease locally is conditioned by the varieties grown. Distinction is made between susceptibility to infection and susceptibility to inroads by the cankers once infection becomes established, and examples are given. Internal host reactions to the presence of diseased areas are considered as to those induced (1) by the vascular cambium and (2) by the phellogen, and major aspects of development of the phellogen and resultant periderm around diseased areas at canker margins are described. These phenomena are shown to depend on the growth activity of the tree. Varieties that begin growth early developed periderm around diseased areas and callus at wound surfaces earlier than others that begin growth late. Observations on plums appear to indicate that cankers in early-blooming varieties stop activity earlier in spring than those in late-blooming varieties. Experimental data showed a certain relation between phellogen occurrence and cessation of canker extension, but failed to prove that the periderm actually prevented canker activity. Twenty-two references are given.

Host organs attacked by bacterial canker of stone fruits, E. E. Wilson and W. B. Hewitt (*Hilgardia [California Sta.], 12 (1939), No. 4, pp. 249–255, figs. 3*).—The less common symptoms on leaves, blossoms, fruit, fruit stems, green shoots, and buds of *Prunus* spp. are discussed in their relation to severe outbreaks. Bacteria isolated from leaves, blossom buds, fruit stems, fruit and green terminal shoots of cherry, apricot, and plum induced cankers identical with those due to *Phytomonas cerasi* from plum. Leaf, fruit, fruit stem, and green shoot infections have not contributed to the severity of epidemics. These infections commonly arise from bacteria originating in bud infections and twig lesions. Blossom and particularly bud infections are frequently serious and develop concurrently with outbreaks of limb cankers. Such infections cause direct crop losses, reduce future fruitfulness of branches, and produce foci for invasion of large limbs. The symptoms resemble those of bacteriosis of cherries and plums in England. In other studies the causal bacteria of the two diseases have proved identical.

Peach mosaic, G. L. Stout (*Calif. Dept. Agr. Bul., 28 (1939), No. 3, pp. 177–200, figs. 10*).—The author reviews the discovery and early history of the disease, including early studies by Reed and Thornberry in California (E. S. R., 74, p. 349), where by 1933 it is said to have come into general prominence and to have aroused much concern. Discussions follow, summarizing present data on the virus nature of the malady, descriptions of the blossom, foliage, fruit, and twig symptoms, the effects on fruit production, its transmission and spread (including extensive orchard records under the author's supervision); hosts, control methods, and a survey of current control operations in California. Fifteen references are included.

Observations on powdery mildew on cultivated blueberries in Massachusetts in 1938, H. F. Bergman. (U. S. D. A.). (*Phytopathology*, *29* (*1939*), *No. 6, pp. 545, 546*).—Of the varieties now grown in Massachusetts, Pioneer is said to be the most susceptible to the *Microsphaera* powdery mildew, with Cabot and Wareham following in the order named, and Harding and Katherine apparently the most resistant. Data are presented suggesting the possibility of obtaining by selection from crosses varieties that will be more resistant than those now grown.

Avocado sun-blotch in Florida, H. E. Stevens. (U. S. D. A.). (*Phytopathology*, *29* (*1939*), *No. 6, pp. 537–541, fig. 1*).—Definite cases of sun-blotch, a disease believed to be of virus origin, are reported from a single grove in Florida, but only on Taylor and Nabal avocados topworked on Taft trees. The possible source of this infection is discussed, but is believed to be obscure unless the Taft variety served as a latent carrier. Sun-blotch has occurred previously in Florida only in sporadic cases.

Scaly bark in relation to propagation of citrus trees, H. S. Fawcett. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, *24* (*1939*), *No. 7, pp. 242, 262, figs. 3*).—This is a summary of the author's studies of this transmissible disease, now believed to be of virus origin, discovery of the leaf symptoms of which (1933) is said to have furnished a means of studying the malady and of indicating something of its real nature. See also a previous note (E. S. R., 80, p. 505).

Economics of scaly bark in orchard management, H. Hepner (*Calif. Citrog.*, *24* (*1939*), *No. 7, pp. 242, 250, 251*).—This is a general discussion of the effects of psorosis on citrus orchard efficiency, with detailed analysis of returns in a ±8-acre orchard where ±12 percent of badly diseased trees are estimated to have decreased the profits by 28 percent.

Recommendations for the control of scab and foliage diseases of pecans in the Southeast, J. R. Cole and J. R. Large (*U. S. Dept. Agr., Bur. Plant Indus.*, *1938*, *pp. 4*).—Directions are given for controlling these diseases by sanitation and by spraying with bordeaux mixture.

A bud and twig blight of azaleas caused by Sporocybe azaleae, W. H. Davis. (Mass. State Col.). (*Phytopathology*, *29* (*1939*), *No. 6, pp. 517–529, figs. 2*).—This blight is reported as threatening to exterminate some species of the cultivated and native azaleas in Massachusetts. The fungus, related to *Graphium ulmi* and in like manner plugging the vessels with tyloses, has been reported as parasitizing rhododendrons in New Jersey and California, but only two infected buds were observed on these hosts in Massachusetts. The symptoms on infected buds, flowers, and plants and the cultural characters of the fungus are described. For the substratum ±pH 6 was preferable, and the optimum temperature for growth was 22°–25° C. A maturing culture is described. Initial infection was found to occur in the axils of the lower bud scales, where bud and stem tissues were penetrated, the fungus then advancing into the bark and pith cells filled with stored starch grains and traversing the vascular system. The parasite kills the buds, prevents the formation of new flowers, leaves, and stems, arrests photosynthesis, girdles the stems, and plugs the phloem, all of which results in necrosis. The fungus could be cultured from infected stems as long as the inner bark remained green. Nine azalea and rhododendron (the same generic name used for both) species were inoculated, the results indicating *Rhododendron arborescens* and *R. viscosum* to be resistant, and *R. nudiflorum* and *R. canescens* to be susceptible. The rhododendrons are considered resistant. The disease was controlled by pruning and destroying infected materials, and either spraying or dusting with copper fungicides (copper-lime dust 57 or 5-5-50 bordeaux used).

Fungi of the Duke Forest and their relation to forest pathology, F. A. WOLF, with collab. of K. H. GARREN and J. K. MILLER (*Duke Univ. Forestry Bul. 2 (1938), pp. 122, figs. 53*).—The stated purpose of the present bulletin was to record the fungi collected in the Duke Forest during the past 6 yr. The list is not limited to species on woody plants because herbaceous species are ecologically a part of the forest and some of them are alternate hosts for certain of the rusts. Consideration is given to the more important pathological problems suggested by the collections and observations, and to an evaluation of the status of available knowledge of certain specific tree diseases. The more important fungi causing diseases or decays are discussed for alder, ash, beech, buckeye, cedar, cherry, elm, sweet gum, hickory, holly, honey locust, black locust, maple, mulberry, oak, pine, tulip poplar, red bud, dwarf sumac, sycamore, and black willow, and for the fir-fern rusts. A list of fungi systematically arranged and a host index are included.

A survey of forest tree diseases and their relation to stand improvement in the Lake and Central States, R. C. LORENZ and C. M. CHRISTENSEN. (Coop. Univ. Minn. et al.). (*U. S. Dept. Agr., Bur. Plant Indus., 1937, pp. [5]+52, pls. 11, fig. 1*).—The report (with 28 literature references) of this survey discusses the nature and causes of tree diseases, tabulates the estimated prevalence of diseases of conifers and of hardwoods in the Lake and Central States, considers specific diseases (heart rots, cankers, burls, needle and twig diseases of conifers, leaf diseases of hardwoods, mycorhizas, mistletoe, and nonparasitic diseases), gives an example of a disease problem on a timber sale area (aspen) involving *Fomes igniarius*, and discusses forest practices and their effects on diseases.

Observations on fructification of Ceratostomella ulmi in England, J. M. WALTER. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 6, pp. 551–553*).—In England, very abundant coremia and perithecia of *C. ulmi* were noted in dead, dying, and fallen elms. Their most plentiful development was on the xylem surface of trees from which the bark had just begun to loosen, but they develop commonly in the galleries of the bark beetles *Scolytus scolytus multistriatus*. The largest numbers of perithecia were found on surfaces that had produced coremial stands 2–4 weeks previously. Logs in contact with moist soil yielded more extensive stands of coremia and perithecia than standing dead trees. Fresh coremia were found throughout the year, but during the observation period (3 yr.) perithecial development apparently ceased during November and did not begin again until about mid-March.

Scouting and sampling elms with symptoms commonly associated with the Dutch elm disease as an aid in eradicating Ceratostomella ulmi, R. P. TRUE and S. S. SLOWATA. (U. S. D. A. et al.). (*Phytopathology, 29 (1939), No. 6, pp. 529–537, fig. 1*).—Biweekly observations on 2,239 trees in 1936 and 4,424 trees in 1937 indicated that as the summer advanced the number of elms showing these external symptoms increased markedly until mid-September, when defoliation set in. However, only a small percentage of the trees observed proved to be actually infected with *C. ulmi*, and those showing symptoms plus *C. ulmi* infection before September 1 nearly all did so before mid-August. The efficiency of symptom sampling was at its maximum during late June and throughout July. In the most completely sampled plats 12–26 percent of the trees showed external symptoms, while 3–10 percent of the latter also showed internal symptoms and had to be diagnosed by culturing from selected samples. By this technic, 0.007–2.325 percent of all the trees were found infected. Among 419 felled plat trees, careful examination and culturing indicated 12 trees not showing external symptoms to be infected with *C. ulmi*. Nine of 24 infected trees recovered in the sense that the infection became occluded, though the fungus was found to have

remained alive within certain trees for several years. The ultimate relation of such infections to eradication is at present unknown.

The relation of Saperda tridentata to infection of American elm by Ceratostomella ulmi, L. J. Tyler, K. G. Parker, and L. L. Pechuman. (Cornell Univ.). (*Phytopathology, 29 (1939), No. 6, pp. 547–549*).—Through wounds made by the common elm borer, *S. tridentata*, 2- to 4-yr. budded elms in pails were inoculated in the greenhouse with *C. ulmi*, infection being obtained whether inoculation was by fungus-infested beetles or by atomizing these wounds with a spore suspension. However, the infected trees failed to wilt, and examination indicated that the fungus invasion was not extensive, due, it is believed, to the fact that the beetles fed on the more succulent parts of growing shoots. Injection of spores into such tissue on other trees also failed to result in extensive invasion. Inoculation by infested beetles was slightly more successful than by atomizing the wounds with spore suspensions.

The hemlock rust caused by Melampsora farlowii, G. H. Hepting and E. R Toole. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 6, pp. 463–473, figs. 2*).—In certain commercial nurseries of western North Carolina, eastern hemlocks had up to 82 percent of their 1938 shoots killed by a twig blight shown by inoculations to be due to the autoecious *M. farlowii*. Carolina hemlock proved much more resistant. In spraying experiments the most efficient control was obtained by weekly spraying with lime-sulfur (4 lb. dry form to 50 gal. water) through May. Sprayed trees had 3 percent of their twigs killed, as compared with 19 percent for the controls. The cost of spraying a 2- to 5-ft. tree was 4 mills per tree per application.

New species of Taphrina on red maple and on silver maple, A. E. Jenkins. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 29 (1939), No. 5, pp. 222–230, figs. 4*).—*T. dearnessii* n. sp., causing a leaf blister of *Acer rubrum*, and *T. carveri* n. sp., one of *A. saccharinum*, are described and illustrated.

Growth and variability of Stereum gausapatum in culture, J. A. Herrick (*Phytopathology, 29 (1939), No. 6, pp. 504–511, figs. 3*).—The causal fungus of heart rot of oak was studied by culturing on agar, the 58 isolates used representing collections at various points throughout the northeastern United States. Transfers from old agar cultures or from those recently derived therefrom grew in an unpredictable way. However, a sufficient number of successive transfers, made at short intervals, gave rise to cultures of predictable behavior, the number of successive transfers necessary for such results varying widely among the 58 isolates. Intensive studies of 12 selected isolates grown in Petri dishes at 25° C. showed them to vary widely in growth rate, as well as in mycelial character and color, but the various individual isolates remained constant in cultural characteristics throughout the nearly 2 years' duration of the study.

Ceratostomella ips associated with Ips lecontei in Arizona, D. E. Ellis (U. S. D. A. et al.). (*Phytopathology, 29 (1939), No. 6, pp. 556, 557*).—The blue-staining fungus *C. ips* is reported in association with the bark beetle *I. lecontei* attacking *Pinus ponderosa* in Arizona.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The wildlife restoration program under the Pittman-Robertson Act of 1937, A. M. Day (*U. S. Dept. Agr., Misc. Pub. 350 (1939), pp. 12*).—This discusses the purpose of the wildlife restoration program, types of suitable projects, projects not contemplated by the act, methods of allocating funds to the States, and project initiation and accomplishment procedure, and gives the text of the Federal law and regulations.

Wildlife of the Atlantic coast salt marshes, W. L. McAtee (*U. S. Dept. Agr. Cir. 520 (1939), pp. 28, pls. 6, figs. 10*).—This circular refers briefly to the zones of salt-marsh plants and the plants of these zones and their value to wildlife, then takes up the more characteristic species of birds, the less characteristic species of fowl, and notes on other wildlife, including reptiles, fishes, and mammals.

Shortening daylight periods between May 15 and September 12 and the pelt cycle of the mink, T. H. Bissonnette and E. Wilson (*Science, 89 (1939), No. 2314, pp. 418, 419*).—The author presents evidence to show that the assumption of winter prime pelt by mink may be induced in summer despite relatively high temperatures or hastened in autumn by reducing the duration of the periods of light (and/or its intensity) to which the animals are exposed daily.

The muskrat [trans. title], H. N. Kluyver (*Tijdschr. Plantenziekten, 42 (1936), No. 12, pp. 311–340, pls. 4, figs. 5; also Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 85 (1937), pp. 33, pls. 4, figs. 5*).—A discussion of the biology and economic importance of the muskrat (*Ondatra zibethica*) in western Europe, where it has become established at many points.

Some notes on rat control in the Mourilyan area, E. H. Fox (*Queensland Soc. Sugar Cane Technol. Proc., 8 (1937), pp. 37–39*).—The observations reported are said to indicate that over 90 percent of the field rats in the Mourilyan area of Queensland belong to the species *Melomys littoralis*.

Combating the field rat in ricefields, P. van der Goot (*Landbouw [Buitenzorg], 13 (1937), No. 9, pp. 405–421; Eng. abs., pp. 419–421*).—A comprehensive account of the common field rat (*Mus rattus brevicaudatus*) in the rice fields of Java and means for combating it.

Parasites of some Minnesota Cricetidae and Zapodidae, and a host catalogue of helminth parasites of native American mice, A. B. Erickson (*Amer. Midland Nat., 20 (1938), No. 3, pp. 575–589, figs. 18*).—This contribution, which includes descriptions of five new species and the erection of the jumping mouse genus *Spiruracerca*, is presented with a host catalog of helminth parasites of native North American mice.

The chemistry and toxicology of pest control [trans. title], G. Peters (*Samml. Chem. u. Chem. Tech. Vorträge. n. ser., No. 31 (1936), pp. 120, figs. 22*).—This contribution, presented in 10 chapters, is accompanied by 201 references to the literature.

Insects and other animal pests (*Nebraska Sta. Cir. 60 (1939), pp. 47–51, fig. 1*).—A brief summary of some of the more important work conducted by the station since its organization.

[Report of work with economic insects in western Washington] (*Western Washington Sta. Rpt. 1938, pp. 20–24*).—Reference is made to work with the cabbage weevil *Ceutorhynchus assimilis* Payk. and the carrot rust fly, both by A. J. Hanson and R. L. Webster; the life history and control of the cherry fruitworm in western Washington, by E. P. Breakey and Webster; and holly insects and their control, the effect of the solvent on rotenone in solution, and the resistance of plants to insect attack, all by Breakey.

Report on the natural enemies in Haiti of the horn-fly (Lyperosia irritans) and the green tomato bug (Nezara viridula), J. G. Myers (*Jour. Council Sci. and Indus. Res. [Austral.], 11 (1938), No. 1, pp. 35–46, fig. 1*).—In the course of an intensive study of the parasites of the horn fly and the southern green stinkbug in Haiti the author found considerable evidence that the former is largely controlled there by natural enemies, of which the most important are a histerid beetle and an anthomyiid larva, both predaceous on the horn fly maggot. The southern green stinkbug is parasitized in Haiti in October and November by a tachinid fly (*Trichopoda* sp.) to the extent of only 4.1 percent.

It is suggested that *T. pennipes* F. in Florida is a more efficient and promising parasite.

Department of entomology, S. G. JARY and M. D. AUSTIN (*Jour. Southeast. Agr. Col., Wye, Kent, No. 41 (1938), pp. 9–14*).—Notes on the occurrence of the more important insects and a brief reference to the experimental work conducted are given with a list of 11 references (E. S. R., 77, p. 219).

[Contributions on economic insects in the Soviet subtropics] (*Sovet. Subtrop. (Soviet Subtrop.), No. 12 (28) (1936), pp. 26–70, figs. 27; Eng. abs., pp. 33, 40, 58, 65, 70*).—Included among the contributions presented are the following: The Scale Species [Principally *Pulvinaria floccifera* Targ. and *Aspidiotus destructor* Sign.] in the Tea Regions, by Sh. I. Patarafà (S. I. Pataraya) (pp. 26–33); The Problem of Citrus Tree Fumigation With Hydrocyanide Gas, by M. P. Voltenko (pp. 34–40); Mechanisation of Citrus Pest Control, by Ю K. Kirtbafà (J. K. Kirtbaya) (pp. 41–58); The Pests of the Main Essential Oil Plants in the Crimea, by S. M. Fedorov and E. P. Kozlova (pp. 59–65); and The Pests [Principally the European Red Mite and the Soft Scale] and Diseases of Citrus Plants Grown in Pots, by I. Seletskiĭ (J. Seletzki) (pp. 66–70).

Report of the entomological section, H. WILKINSON (*Kenya Dept. Agr. Ann. Rpts., 1935, vol. 2, pp. 60–70; 1936, vol. 2, pp. 43–54*).—The occurrence of and work with economic insects in Kenya are reported for the years 1935 and 1936.

Division of entomology, annual report for year 1936, R. W. JACK (*Rhodesia Agr. Jour., 34 (1937), No. 7, pp. 570–592*).—The occurrence and the work of the year with economic insects, including those of medical and veterinary importance, are reported upon (E. S. R., 76, p. 657).

[Report of entomological work in the Sudan during the season 1934–35], H. W. BEDFORD (*Sudan Govt., Agr. Res. Serv. Ann. Rpt., 1935, pp. 63–96, pls. 2*).—The work reported upon relates to a general survey of insect pests of crops in the Sudan (including enemies of cotton and sorghum and two garden pests), experimental work with and control measures for the same pests, forest entomology, veterinary entomology, and apiculture.

Report of the entomologist, 1935, A. H. RITCHIE (*Tanganyika Dept. Agr. Ann. Rpt., 1935, pp. 95–103*).—A report of the occurrence of and work of the year with insects in Tanganyika (E. S. R., 74, p. 229), particularly those attacking coffee, and notes on cotton and miscellaneous pests.

[Report of work in entomology in 1935–36 and 1936–37] (*Uganda Dept. Agr. Ann. Rpts., 1936, pt. 2, pp. 8–39; 1937, pt. 2, pp. 7–42*).—In the report for 1935–36, reports by H. Hargreaves (pp. 8–11) and A. M. Gwynn (pp. 12–18) deal with the occurrence of and work with the more important insects of 1935 (E. S. R., 75, p. 808), followed by an extended report on a year's investigation of the pink bollworm in Uganda, March 1935 to April 1936, by T. H. C. Taylor (pp. 19–39). For 1936–37 the work reported upon includes the Report of the Senior Entomologist for 1936, by H. Hargreaves (pp. 7, 8), the Report of the Entomologist, Serere, 1936–37, by A. M. Gwynn (pp. 33–39), and Pink Boll Worm (*Platyedra gossypiella* Saund.), by T. H. C. Taylor (pp. 40–42). In a Report on Investigations of Cotton Stainers (*Dysdercus* spp.) for 1936, H. Hargreaves and T. H. C. Taylor (pp. 9–32) report upon the bionomics, alternative host plants, natural control, annual cycle, and measures for control of the four species of *Dysdercus* occurring on cotton in Uganda (*D. nigrofasciatus* Stal, *D. superstitiosus* Sign., *D. fasciatus* Sign., and *D. cardinalis* Gerst.).

Entomological investigations, G. A. JULIUS ET AL. (*Austral. Council Sci. and Indus. Res. Ann. Rpt., 11 (1937), pp. 15–21*).—The progress of investigational work (E. S. R., 77, p. 815) with ectoparasites and with blood parasites of cattle; ephemeral fever of cattle (suspected of being insect-borne); orchard and fruit

pests, including the oriental fruit moth and the codling moth; field and pasture pests; termites; several other insect and snail pests, etc., is briefly considered.

Insect pests of the maize-crop in Java, C. J. H. FRANSSEN (*Landbouw [Buitenzorg], 12 (1936), No. 2, pp. 57–105, figs. 72; Eng. abs., pp. 104, 105*).—Brief notes are given on the life history and control of 41 species of insects attacking corn in Java, most of which are of minor importance. The 11 which occasionally cause serious damage are the white grubs *Holotrichia helleri* Brske. and *Aprosterna aerea* Perty, the larvae of the weevil *Hypomeces squamosus* F., 3 cutworms (the black cutworm, *Euxoa segetum* Schiff., and *E. interjectionis* Guen.), the European corn borer, the purplish stem borer *Sesamia inferens* Walk., the grasshopper *Valanga nigricornis* Burm., the armyworm *Laphygma exempta* Walk., and the cantharid beetle *Epicauta ruficeps* Ill., and these are treated somewhat more in detail.

Cotton insect investigations. (Coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 29 (1938), pp. 78, 79, figs. 2*).—Brief report is made of the results of control work with the bollweevil on upland, or short staple, and sea-island, or long staple, cotton.

Some insects injurious to pear-trees, S. TSENG and C. HO (*Lingnan Sci. Jour., 16 (1937), Nos. 2, pp. 249–259; 3, pp. 457–462, pls. 3*).—Descriptions of the several stages, life history and habits, distribution and habitat, and control measures are reported for the tree cricket *Calyptotrypus hibinonis* Mats. and the pear stinkbug *Urochela luteovaria* Distant, common and injurious enemies of orchards in Tsingtao, and for *Rhynchites heros* Roel., which is widely distributed, causing great damage to the fruit.

Insect and allied pests of the papaw, J. H. SMITH (*Queensland Agr. Jour., 48 (1937), No. 5, pp. 553–557, figs. 7*).—In this brief account particular mention is made of the common red spider, the fruit-spotting bug *Amblypelta lutescens* Dist., the southern green stinkbug, and the yellow peach moth *Dichocrocis punctiferalis* Guen. as enemies of the papaw.

[Observations on citrus insects near Swatow, China], I. J. CONDIT, W. E. HOFFMANN, and H. C. WANG (*Lingnan Agr. Jour., 1 (1935), No. 2, pp. 192–235, figs. 24; Eng abs., pp. 242–245*).—Observations of some 80 insect pests of citrus in China, most of which are known to occur in Kwangtung Province, are reported. The majority of these are briefly described and biological and bionomical notes given.

[Notes on citrus insects in Kwangtung Province, China], W. E. HOFFMANN (*Lingnan Agr. Jour., 2 (1936), Nos. 1, pp. 165–218, figs. 42, Eng. abs. pp. 215–218; 2–4, pp. 378–396, figs. 3, Eng. trans. pp. 384–396*).—These contributions, in the first of which 38 miscellaneous insects of importance and in the second papilionid and lycaenid caterpillars are considered, supplement the account above noted.

[Coconut and coffee pests in New Guinea], J. L. FROGGATT (*New Guinea Agr. Gaz., 2 (1936), No. 3, pp. 18–24*).—Brief accounts are given of the more important insect enemies of the coconut (pp. 18–21) and of two coccid pests (*Pseudococcus* sp. and the green scale) of coffee (pp. 22–24).

Pests of the carnation and their control, E. R. SPEYER (*Sci. Hort. [Wye, Kent, Eng.], 6 (1938), pp. 72–85, pls. 2*).—This contribution from the Experimental and Research Station, Cheshunt, Herts, includes a list of 43 references to the literature.

Pests of commercial ornamental plants, G. FOX WILSON (*Sci. Hort. [Wye, Kent, Eng.], 6 (1938), pp. 102–116*).—Included in this account is an appendix listing the chief pests of some ornamental flowering and foliaged plants grown for market, including their host plants and common names.

Recent research on wood-destroying insects, R. C. FISHER (*Jour. Roy. Soc. Arts, 85 (1937), No. 4400, pp. 407–425, figs. 2*).—A review of recent work with *Lyctus* powder-post beetles and the deathwatch beetle *Xestobium rufovillosum* DeG.

Destruction of timber by marine organisms in the port of Brisbane, C. J. J. WATSON, F. A. McNEILL, R. A. JOHNSON, and T. IREDALE (*Queensland Forest Serv. Bul. 12 (1936), pp. X+107, figs. 23*).—The results of over 5 yr. of intensive research on the destruction of timber by marine organisms, conducted by the Queensland Forest Service, are reported. Nine distinct species of destructive timber borers have been discovered in the Brisbane River and Moreton Bay, and the damage occasioned by each on a range of special test samples was systematically observed at several carefully selected control stations. These methods enabled the relative resistance of each timber to be determined.

In a systematic account of the teredinid mollusks of South Queensland, by T. Iredale (pp. 31–44), the genus *Glumebra* is erected and seven species representing six genera are described as new to science.

Studies on some of the factors involved in the use of sodium arsenite against the Mormon cricket (Anabrus simplex Hald.), E. B. HASTINGS and J. H. PEPPER (*Montana Sta. Bul. 370 (1939), pp. 26, figs. 8*).—Earlier studies have shown the desirability of using some diluent in spreading the sodium arsenite used in the field to combat the Mormon cricket in order to better regulate the distribution of the poison. In the experiments here reported hydrated lime, bentonite, calcium carbonate, celite, diatomaceous earth, and volcanic ash, when added to sodium arsenite, were found to act solely in the role of diluents. The uniformity of the dust cloud was shown to depend largely on the difference in size of the particles of the diluent. The diluents tested were not effective in insuring a uniform distribution of the sodium arsenite. Thus, the dust cloud was not a measure of the distribution of the poison.

"Prolonged jarring of receptacles containing mixed dusts did not alter appreciably the concentration either on the top or bottom of the containers. Sodium arsenite dusts were found to be effective in treating Mormon crickets when applied either as purely contact poisons or as stomach and contact poison combined. When their tarsi alone were dipped in the dust the length of time to obtain a 50-percent mortality of the crickets was greatly increased. An increase in temperature was found to bring about a corresponding decrease in time for a 50-percent kill in both nymphs and adults when dusted with sodium arsenite dusts. Temperature changes were found to have a greater effect on adults than on immature stages. Each of the six diluents studied was apparently inert when used in connection with cricket dusts. If sodium arsenite dust is removed from the surface of crickets within 45 min. after dusting, a considerable decrease in percentage mortality may be expected."

The desert locust, R. C. MAXWELL DARLING (*Sudan Notes and Rec., 19 (1936), No. 1, pp. 168–175*).—This is an account of *Schistocerca gregaria* Forsk., investigations of which and of the red locust *Nomadacris septemfasciata* Serv. and the tropical migratory or hairy chested locust *Locusta migratoria migratorioides* R. & F., the forms of major economic importance in Africa, are under way.

Banana rust thrips control, N. E. H. CALDWELL (*Queensland Agr. Jour., 48 (1937), No. 4, pp. 392–399, fig. 1*).—An account of *Scirtothrips signipennis* Bagn., long known as a pest of cultivated bananas in Queensland and of increasing importance in the last two decades.

The control of banana rust thrips, N. E. H. CALDWELL (*Queensland Agr. Jour., 50 (1938), Nos. 2, pp. 144–163, figs. 3; 3, pp. 295–316, figs. 8; 4, pp. 422–449, figs. 4; 5, pp. 576–584*).—A report of further studies of the biology, im-

portance, and control of *Scirtothrips signipennis* Bagn., as related to the rust of banana fruit in Queensland.

A leaf-hopper (jassid) on rhododendron, G. Fox Wilson (*Jour. Roy. Hort. Soc., 62 (1937), No. 5, pp. 210–213, pls. 4*).—A North American jassid enemy of rhododendrons (*Graphocephala coccinea* Forst.) that has been introduced into Great Britain and become well established in Surrey gardens is reported upon.

Progress of work on Sexava spp., the coco-nut treehopper, B. A. O'Connor (*New Guinea Agr. Gaz., 3 (1937), No. 1, pp. 1–4*).—This contribution on coconut treehoppers (*Sexava* spp.) supplements the report by Froggatt previously noted (E. S. R., 76, p. 218).

Aphis migration and distribution in relation to seed potato production, W. M. Davies (*Sci. Hort. [Wye, Kent, Eng.], 5 (1937), pp. 47–54*).—The importance of a knowledge of the influence of local conditions upon the movement of aphids in the raising and maintenance of virus-free stocks of crop plants is emphasized.

Kwangtung Aphididae including hostplants and distribution, W. E. Hoffmann (*Lingnan Sci. Jour., 16 (1937), No. 2, pp. 267–302; Chin. abs., p. 302*).—The present contribution records 25 additional species of aphids from Kwangtung, making 64 species from the Province and representing about one-half of the species that have been recorded from the whole of China. The notes on these species include synonymy, Kwangtung hosts, and hosts elsewhere. A plant host list and an index to Kwangtung aphids are included.

The cabbage aphis (Brevicoryne brassicae L.), F. R. Petherbridge (*Jour. Min. Agr. [Gt. Brit.], 45 (1938), No. 2, pp. 140–148, pls. 2*).—Observations on the life history and experiments on control of the cabbage aphid, one of the most serious pests of cabbage and related plants in Great Britain, are reported.

A list of the scale insects and mealy bugs (Coccidae) and their host-plants in South Africa, H. K. Munro and F. A. Fouché (*Union So. Africa Dept. Agr. and Forestry Bul. 158 (1936), pp. 104*).—A list of host plants (pp. 11–68), a list of insects (pp. 69–96), and the known distribution of species of Coccidae notified as pests (pp. 97, 98), together with a vocabulary of English common names are presented.

The cyanide fumigation of citrus trees in the eastern Cape Province, South Africa, B. Smit (*Union So. Africa Dept. Agr. and Forestry Bul. 171 (1937), pp. 39, pl. 1, figs. 22*).—This is a practical account of cyanide fumigation of citrus trees for scale control in the Union of South Africa.

Researches on the development and epidemiology of Aspidiotus pyri (Licht.) Reh. on the generation of the year 1935, G. I. Szelényi (*Kisérlet. Közlem., 39 (1936), No. 4–6, pp. 159–170, fig. 1; Ger., Eng. abs., pp. 168–170*).—This contribution deals with a scale insect which is widely distributed over Hungary and infests a variety of hosts, principally apple and pear.

Sexual dimorphism and post-embryonic growth in Dialeurodes dissimilis Quaint. and Baker (Homoptera, Aleurodidae), M. L. Roonwal (*Natl. Acad. Sci., India, Proc., 6 (1936), No. 3, pp. 196–203, figs. 3*).—Having shown for the first time that sexual dimorphism occurs in the nymphs of a species of the Aleurodidae (*D. dissimilis*), the author is led to believe that it occurs in other Aleurodidae as well.

Studies on gustatory reactions and feeding of wattle bagworm, with special reference to dusted foliage, L. B. Ripley, B. K. Petty, and P. W. van Heerden (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 148 (1936), pp. 27, figs. 12*).—The details of the work conducted are graphically presented in charts.

Control of the wattle bagworm Acanthopsyche junodi Heylaerts by dusting with natural cryolite, L. B. Ripley, B. K. Petty, G. A. Hepburn, and J. P. v. d. Westhuysen (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 152 (1936), pp. 22*).—In continuation of the preliminary contributions (E. S. R., 74, p. 520), the report here presented includes the results of some fifty field tests over two seasons during which more than 10 tons of natural cryolite were applied. They are said to have removed all doubt as to the efficiency and practicability of its use.

On the development of the tusser Antheraea pernyi Guérin-Meneville, with special reference to the comparative embryology of insects, S. Saito (*Jour. Faculty Agr., Hokkaido Imp. Univ., 40 (1937), No. 2, pp. 35–109, pls. 11, figs. 4*).—This contribution on the silk-producing tussah moth *A. pernyi* is presented with a list of 160 references to the literature.

Controlling the fruit-tree leaf roller, L. Haseman and H. E. Brown (*Missouri Sta. Cir. 203 (1939), pp. 4, figs. 2*).—A practical account.

Notes on the biology of the nun moth and its main insect parasites [trans. title], S. Kolubajiv (*Lesnická Práce, 16 (1937), No. 4, pp. 169–199, figs. 2; Ger., Eng. abs., pp. 196–199*).—An account is given of the biology of *Porthetria* (*Lymantria*) *monacha* L. and its parasites, of which the tachinid *Parasetigena silvestris* B. B. (=*segregata* Rond.) is the most important.

The apple pith moth, M. Miles (*Jour. Min. Agr.* [*Gt. Brit.*], *44 (1937), No. 2, pp. 138–142, pls. 3*).—This is an account of *Chrysoclista atra* Haw., which has caused a great deal of damage locally in apple plantations in the south and east of England, and in the spring of 1936 became more serious and widely distributed in south Lincolnshire, Cambridgeshire, Kent, and Hertfordshire.

Contribution to the knowledge of the morphology and biology of Polia (Mamestra) pisi L. [trans. title], A. Melis (*Redia, 22 (1936), pp. 1–31, pls. 4, figs. 20; pp. 33, 34; abs. in Rev. Appl. Ent., 24 (1936), Ser. A, No. 8, pp. 484, 485*).—Observations of the life history and bionomics of a noctuid, the larvae of the first generation of which in Italy skeletonize the leaves of peas and cause a marked reduction in the crop. It was determined later to have been *Barathra* (*Mamestra*) *brassicae* L.

Notes on the life history of Prodenia littoralis Boisd. (Lep., Noctuidae), Y. C. Ng (*Lingnan Sci. Jour., 16 (1937), No. 2, pp. 261–266, pl. 1; Chin. abs., p. 266*).—This is a report of observations of *P. littoralis*, a very general feeder known as the tobacco cutworm, in Canton, where during the latter half of the year three generations were recorded and in which during October, November, and December it requires some 40 to 45 days to complete its life cycle.

Studies on the spring brood larvae of the paddy borer Schoenobius incertellus Walker, C. Y. Liu (*Lingnan Sci. Jour., 15 (1936), No. 4, pp. 543–556; Chin. abs., p. 556*).—In observations at Kashing and Hangchow, China, from 86 to 98 percent of the hatched larvae of the rice borer *S. incertellus* were found to be able to bore into the seedlings. The percentage of survival of the spring brood larvae in terms of mature larvae and pupae varied from 0 to 10. The submergence of leaf sheath of the rice seedling is suggested as a possible method to prevent the larvae from boring into the seedlings after hatching and to kill those which have previously bored into the seedlings, but there are still some problems to be cleared up.

The light-brown apple moth Tortrix postvittana Walker, J. W. Evans (*Tasmanian Jour. Agr., 8 (1937), No. 3, Sup., pp. [2]+18, figs. 6*).—An account of the life history, bionomics, and economic importance of and control measures for *T. postvittana*. This is the most injurious insect enemy of apples in certain districts in Tasmania, where under orchard conditions there are two generations each year, only one of which damages fruit.

Contribution to a study of the anatomy and physiology of the larval stage of the Mediterranean flour moth (Ephestia kuehniella Zell.) [trans. title], R. G. BUSNEL (*Rev. Path. Vég. et Ent. Agr. France, 24 (1937), No. 2, pp. 137–162, figs. 5*).—This contribution is presented with a list of 15 references.

A contribution to the study of Ephestia elutella Hbn. [*trans. title*], F. CHABOUSSOU (*Rev. Zool. Agr. et Appl., 36 (1937), Nos. 2, pp. 20–32, figs. 3; 3, pp. 36–48, figs. 4; 6, pp. 81–90, fig. 1; 7, pp. 100–109; 10, pp. 154–158; 12, pp. 184–190*).—This contribution deals with the anatomy, physiology, life cycle, parasites, economic importance, and means of control of the adult and larval stages of the tobacco moth. The contribution is accompanied by a bibliography of 37 titles.

Studies on the apple fruit borer Grapholitha inopinata Heinrich, M. TAKIZAWA (*Res. Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 16 (1936), pp. 77–112, pls. 6, figs. 7; Eng. abs., pp. 109–112*).—The results of studies during the seasons of 1934 and 1935 especially on the life history of and control measures for the apple fruit borer *G. inopinata*, which is generally recognized as the most serious enemy of fruit of the apple in southern Manchuria, including Kwangtung Province, are reported. While its distribution is not definitely known, the pest appears to be confined to southern Manchuria, being most commonly present in the apple orchards south of the Gaipin Prefecture.

Studies of the red plum worm Laspeyresia (Grapholitha) funebrana Treit. [trans. title], P. BOVEY (*Rev. Path. Vég. et Ent. Agr. France, 24 (1937), No. 3–4, pp. 189–317, figs. 68*).—Report is made of a study of the morphology, life history, habits, and natural enemies of and means of control for *L. funebrana* conducted in Switzerland, the details being given in tables and graphs. The contribution is presented with a list of 75 references to the literature.

Field comparisons of insecticides for control of the codling moth, J. R. EYER (*New Mexico Sta. Bul. 259 (1938), pp. 44, figs. 14*).—This further report on control measures for the codling moth (E. S. R., 79, p. 364) reviews the results of field spraying experiments for the control of this pest conducted at the station during the past 9 yr.

In work with lead arsenate and lead arsenate substitutes in the southern part of the State it was shown that of all of the insecticides tested only lead arsenate affords a high and consistent degree of freedom from infestation. "Where six applications, consisting of a calyx and five cover sprays, are used, a reasonable degree of protection, resulting in 85 to 95 percent of sound fruit, can be secured. With a split schedule using arsenate of lead in the first three applications and one of the more effective organic insecticides, such as oil-nicotine or phenothiazine, in the last three cover sprays, the amount of control is reduced to 65 or 75 percent. Where the arsenical applications are reduced to a calyx and one cover spray, only a very moderate degree of protection, e. g., 50 to 65 percent of sound fruit, is secured.

"Fruit receiving three applications of lead arsenate almost invariably exceeds the tolerance of arsenic residue at harvest, regardless of what supplementary materials are used, but when only two applications of lead arsenate are used the deposit of arsenic is usually below tolerance at harvest. Next to lead arsenate, aluminum silicofluoride or cryolite was the most promising insecticide tested, but Federal regulations regarding the amount of deposit at harvest likewise restrict its use to a small number of applications. Some degree of encouragement was found in the use of certain spreaders, stickers, and conditioners to increase spray deposit, particularly triethanolamine oleate and summer oil, bentonite clay, copper resinate oil, and certain proprietary colloids.

"Weather conditions, particularly dry, hot summers, apparently interfere with the efficiency of organic insecticides like oil-nicotine and phenothiazine, which,

according to other investigators, have proved to be much more promising in other regions than in New Mexico. Late frosts occasionally destroy the apple crop and during such years the codling moth population is reduced considerably, although not entirely destroyed. Control during years immediately following crop destruction is comparatively easy."

The European corn borer and corn hybrids, L. L. HUBER. (Coop. U. S. D. A. et al.). (*Ohio Sta. Bimo. Bul. 197 (1939), pp. 26–28, figs. 3*).—This article describes and identifies the areas of Ohio that appear to be most favorable to the corn borer and in which appreciable commercial damage has been caused, and discusses briefly the principles which underlie present recommendations for control.

Fifteen yr. of investigations have shown that the avoidance of abnormally early planting on well-drained, fertile soil and the use of resistant and tolerant strains of corn are the best defense against the corn borer. These two measures are relatively effective and can be applied individually. Fundamentally they are preventive measures. It is pointed out that the principles are identical with those involved in later planting. Just as borer survival is higher on early than on late-planted corn, it is also higher on early than on late-season strains. It is the difference in borers per stalk that most growers and seedsmen have in mind when they say that a certain strain is resistant to the corn borer, and this is a type of resistance associated with seasonal maturity. Resistance other than that accounted for through seasonal maturity is present in certain strains, but in general it is not of important commercial consequence.

The maize trap crop for the control of corn ear worm in cotton, W. J. S. SLOAN (*Queensland Agr. Jour., 49 (1938), No. 1, p. 76*).—Reporting briefly upon work conducted in the experimental field the results obtained are said to have been sufficiently promising to justify a considerable extension of experimental work on a maize trap for the control of the corn earworm in cotton during the current season.

Some observations on the salivary and stomach secretion of Anopheles and other mosquitoes, A. DE BUCK (*K. Akad. Wetensch. Amsterdam. Proc., 40 (1937), No. 2, pp. 217–223*).—The studies reported relate to agglutination of the red blood corpuscles by the salivary secretion of *A. maculipennis* and other mosquitoes, delay of coagulation of the blood caused by the strong anticoagulin in the salivary secretion, acceleration of coagulation of the blood resulting from a strong coagulin in the stomach secretion, and reaction of the skin.

It was found that the hemagglutinin in the salivary secretion of *A. maculipennis* is present in the median acinus only, and the salivary glands of *Theobaldia annulata* contain a weak hemagglutinin. The anticoagulin in the salivary secretion of *A. maculipennis* is present almost exclusively in the median acinus. The secretion of the posterior portion of the mid-gut of *Culex pipiens* and *T. annulata* contains a coagulin. The secretion of the lateral acini of the salivary glands of *A. maculipennis* seems to be responsible for the irritating and wheal-producing action of the saliva.

A new larvicide, W. OMAR (*Jour. Egypt. Med. Assoc., 19 (1936, No. 10, pp. 592–608*).—The acid oil sludge which is a waste product in the oil-refining industry was found by the author to have a powerful insecticidal action on the larvae and pupae of mosquitoes (*Culex* and *Anopheles*). This property seems to be mainly due to its soluble ingredients. One part of sludge when added to 1,000 parts of water was found to kill all the developmental stages of the mosquito in a few hours. It has many advantages over other larvicides used in practice, the most important being that it is a waste product without monetary value.

Recent investigations on the buffalo fly Lyperosia exigua de Meijere and its parasites in north Australia, T. G. CAMPBELL (*Jour. Council Sci. and Indus. Res. [Austral.], 11 (1938), No. 1, pp. 77–82, fig. 1*).—Observations made on the density of the buffalo fly *L. exigua* in localities in Australia where parasites (*Spalangia* spp.) have been liberated showed that they had not become established, the numbers of the flies having been found much the same as in previous years.

A laboratory method for testing tropisms of blowflies, D. J. LEE (*Jour. Council Sci. and Indus. Res. [Austral.], 10 (1937), No. 4, pp. 271–274, fig. 1*).—A method for testing the chemotropisms of blowflies, devised during the course of work on a laboratory technic for investigation of their responses to attractants and repellents, and, particularly, attractive materials in fleece wool, is described.

A survey of the Australian sheep blowflies, I. M. MACKERRAS and M. E. FULLER (*Jour. Council Sci. and Indus. Res. [Austral.], 10 (1937), No. 4, pp. 261–270, fig. 1*).—In an examination of 1,691 strikes from all the sheep-raising parts of Australia in the course of a survey which extended over several years, *Lucilia cuprina* was found to be the most important and widespread of the sheep flies in the Commonwealth. The species of *Calliphora*, especially *C. nociva*, are responsible for about one-fifth of the strikes, chiefly in southern districts. The English sheep fly *L. sericata* was found to be of no practical importance in Australia.

Details of the survey are presented in tables.

Studies on the sheep blowfly problem (*N. S. Wales Dept. Agr., Sci. Bul. 54 (1937), pp. 126, figs. 71*).—The studies here contributed are A Review of the Sheep Blowfly Problem in New South Wales (pp. 7–60) and Observations on Fleece Rot and Body Strike in Sheep, Particularly in Regard to Their Incidence, Type of Sheep Susceptible, and Economic Importance (pp. 61–95), both by H. G. Belschner; Bacterial Colouration of Wool, by H. R. Seddon (pp. 96–110); The Classification of Sheep According to Susceptibility to Blowfly Strike, by H. R. Seddon and H. G. Belschner (pp. 111–122); and Relationship of Rainfall to Crutch Strike by Sheep Blowflies (pp. 123–126).

The control of the onion fly, D. W. WRIGHT (*Jour. Min. Agr. [Gt. Brit.], 44 (1938), No. 11, pp. 1081–1087, pl. 1*).—Observations of the life history and habits of the onion maggot in the eastern counties of England are presented. Control measures in Europe and North America are briefly reviewed and experiments involving the use of deterrents and larval poisons described. Satisfactory control was obtained by the use of calomel powder applied to the seed before planting.

Biology and control of three noxious fruitflies in Java, C. J. H. FRANSSEN (*Landbouw [Buitenzorg], 13 (1937), No. 5, pp. 221–238, figs. 11; Eng. abs., pp. 237, 238*).—Of the fruitflies indigenous in Java, only three have been found to be a source of injury, namely, *Dacus ferrugineus* Coq., which may cause serious damage especially to Spanish pepper, 100 percent of the crop being at times infested, and also to mangoes, bananas, oranges, coffeeberries, etc.; *D. umbrosus* F., which has been found in jack fruit (*Artocarpus integra*) and tjampedak (*A. champeden*); and the melonfly, injurious chiefly to cucumbers, melons, and other cucurbits, and to tomatoes, papaw, and other plants.

A contribution to the knowledge of the puparia of Anthomyidae, M. N. STORK (*Tijdschr. Ent., 79 (1936), No. 1–2, pp. 94–168, figs. 35*).—This contribution is presented with a four-page list of references to the literature.

Control of Hylemyia brassicae Bché.: Results of five years' experiments in Mory near Warsaw, Poland, J. W. RUSZKOWSKI and J. GAWINOWA (*Rocz.

Ochrony. Roślin, 3 (1936), No. 2, pp. 136–167; Eng. abs., pp. 165, 166).—The authors report upon a study of the cabbage maggot, the most injurious insect of cabbage and cauliflower crops, especially the early plants, in Poland. It is said to have appeared near Warszawa (Warsaw) in great numbers, producing 96.5 percent of infestations and 39.5 percent of dead plants. The most satisfactory control was obtained from two or three applications of corrosive sublimate.

The contribution is presented with a list of 42 references to the literature.

The chemical control of the sheep maggot fly Lucilia sericata Meigen, W. Moore (*Scot. Jour. Agr., 20 (1937), No. 3, pp. 227–240, pl. 1*).—An account is given of a dip and of a dressing which proved effective in combating *L. sericata.*

Some results of trapping the sheep blowfly Lucilia sericata Meigen, G. D. Morison (*Scot. Jour. Agr., 20 (1937), No. 2, pp. 123–134*).—Data relating to the sites in which sheep blowflies are most numerous, the number and species captured, the correlation of catch to weather and to number of sheep struck, and traps and lures are reported upon, in connection with a list of 25 references.

Catalogue of Chinese Siphonaptera, C. Y. Liu (*Lingnan Sci. Jour., 15 (1936), Nos. 3, pp. 379–390; 4, pp. 583–594; Chin. abs., p. 594*).—A systematic catalog of the Chinese fleas, including host and collection records.

A note on Melasoma populi L. (Chrysomelidae) as a pest of basket willows, H. G. H. Kearns (*Jour. Bath and West and South. Counties Soc., 6. ser., 10 (1935–36), pp. 229–232, pl. 1*).—An account is given of the life history of the chrysomelid beetle *M. populi*, the damage caused to basket willow, and methods of control, including a suggested spray program.

Catalogue of the phytophagous beetles of China, G. Liu (*Lingnan Sci. Jour., 13 (1934), Nos. 1, pp. 109–133; 2, pp. 239–250; 4, pp. 633–660; 14 (1935), Nos. 1, pp. 105–121; 2, pp. 285–298; 3, pp. 415–438; 4, pp. 627–637; 15 (1936), Nos. 1, pp. 19–30; 2, pp. 249–261*).—This is a continuation of the catalog previously noted (E. S. R., 70, p. 651).

A dangerous enemy of the vine in Morocco, Dorysthenes forficatus F. (Coleoptera, Cerambycidae) [trans. title], R. Bouhélier and E. Hudault (*Rev. Zool. Agr. et Appl., 35 (1936), Nos. 10, pp. 145–153, figs. 3; 11, pp. 173–176*).—A report of a study of the cerambycid beetle *D. forficatus*, based upon observations near Boulhaut (Chaouia), Morocco.

The control of flea beetles by means of a seed dressing.—Progress report, C. L. Walton (*Jour. Bath and West and South. Counties Soc., 6. ser., 10 (1935–36), pp. 206–213*).—A dressing consisting of a mixture of paradichlorobenzene and naphthalene dissolved in kerosene, applied at the rate of 0.5 to 1 fluid oz. to each pound of crucifer seed sown at a cost not exceeding 2 d. per acre for materials, was found to have prevented or reduced flea beetle injuries in a considerable number of field trials despite weather conditions that were in many cases very unfavorable.

Wireworms and sugar-beet, F. R. Petherbridge (*Jour. Min. Agr. [Gt. Brit.], 45 (1938), No. 1, pp. 23–27, pls. 2*).—In a number of preliminary experiments (aimed at establishing the first sowing of sugar beets in wireworm-infested fields) that were conducted on various farms in the eastern counties of England, best results were obtained by drilling wheat between the rows of beets. The experiments have shown that under certain circumstances it is possible to obtain a good crop of sugar beets in such fields by drilling the wheat in this way.

The coffee berry-borer in Ceylon (Stephanoderes hampei Ferr.), J. C. Hutson (*Trop. Agr. [Ceylon], 87 (1936), No. 6, pp. 378–383, fig. 1*).—Notes on

[Notes on the New Guinea sugarcane weevil] (*Queensland Soc. Sugar Cane Technol. Proc., 8 (1937), pp. 49–62, 143–152, 265–268, figs. 10*).—The contributions presented include a Progress Report of Sugar Cane Beetle Borer Investigations in North Queensland, by R. W. Mungomery (pp. 49–62); Rind Hardness Determinations as an Aid in Beetle Borer Control, by J. H. Buzacott (pp. 143–152); and Conservation of Crop Residues and Its Relation to Borer Population in the Tully Area by H. G. Knust (pp. 265–268).

Borers in clove trees, L. G. E. Kalshoven (*Landbouw [Buitenzorg], 12 (1936), No. 4, pp. 165–190, figs. 6; Eng. abs., pp. 189, 190*).—Longicorn borers, the main pests attacking clove trees in the Dutch East Indies, include the stem borer *Hexamitodera semivelutina* Hell., a cerambycid thought to be *Coptocercus biguttatus* Donov., the Sumatra clove borer *Nothopeus (Coloborhombus) fasciatipennis* Waterh., and *Chelidonium brevicorne* Schwarzer in Malacca.

Entomological investigations (*St. Lucia Agr. Dept. Rpt., 1935, pp. 20, 21*).—The work of the year (E. S. R., 74, p. 513), with the citrus weevil (*Diaprepes* spp.) is briefly reported upon.

Beekeeping (*Alaska Sta. Bul. 7 [1938], pp. 27, 28*).—Reference is made to the satisfactory wintering of a hive of Golden Italian bees kept in the root cellar, where darkness and a temperature of 34° F. were maintained. Thirty lb. of uncapped comb honey was a sufficient food supply for the winter months. The swarm was placed outside on April 12, and no food was provided after May 6. A production of 99 lb. of extracted honey for the season was found when weighed on October 23.

The weight of bees, nectar, and pollen loads they carry and the causes for the changes of these weights, P. Risga (*Latv. Univ. Rak., Lauks. Fakult. Ser., 3 (1936), No. 1–3, pp. 1–47, figs. 28; Eng. abs., pp. 42–46*).—Results obtained from weighings of bees under varying weather conditions, carried on at Vecauce, Latvia, over a period of years in the apiary of the university, are reported.

On three chalcidoid parasites of cotton borer-beetles from south India, T. V. Ramakrishna Ayyar and M. S. Mani (*Rec. Indian Mus., 39 (1937), No. 2, pp. 125–127*).—*Neocatolaccus indicus* and *Euderus pempheriphila*, attacking the cotton borer beetle *Pempheres affinis* F., are described as new. *E. gossypii* Ferr., parasitic on the larva of another cotton borer beetle (*Sphenoptera gossypii* Kerr.), is recorded for the first time from south India.

Spraying for plum sawfly, with notes on red spider and thrips, F. R. Petherbridge and I. Thomas (*Jour. Min. Agr. [Gt. Brit.], 44 (1937), No. 9, pp. 858–865*).—In the experiments reported a single spraying with 3 percent quassia and soft soap when the cots of Czar and damson plums were beginning to split gave a very good control of the plum sawfly *Hoplocampa flava* L. Mineral oil emulsion and derris also gave a good control, but derris and sulfonated lorol was not quite so good. Mineral oil and derris was the only one of the washes to check the fruit tree red spider *Oligonychus ulmi* Koch and also the pear thrips.

The small spruce sawfly (Lygaeonematus pini Retz.=Nematus abietinus Christ) [trans. title], W. Nägeli (*Mitt. Schweiz. Anst. Forstl. Versuchsw., 19 (1936), No. 2, pp. 213–381, figs. 54; Fr. abs., pp. 371–375*).—A monographic account presented with a list of 147 references to the literature.

Control of cyclamen and broad mites on gerbera, F. F. Smith (*U. S. Dept. Agr. Cir. 516 (1939), pp. 15, figs. 9*).—The several species of *Tarsonemus* mites that occur on *Gerbera jamesoni* in greenhouses, except the broad mite and the cyclamen mite, appear to be saprozoic. The broad mite increases rapidly in

numbers and causes severe diseaselike dwarfing and curling of leaves and abortion and decolorization of flower rays. Dusting infested plants with sulfur is an effective control. The cyclamen mite occurs more generally but in smaller numbers. Foliage injured by the cyclamen mite develops bronzed patches and slight curling. Flowers are rendered valueless by deformation of rays. Sprays, dusts, and fumigants have not controlled this mite on gerbera. Both the cyclamen mite and the broad mite may be destroyed by immersing plants arranged in thin layers on a wire tray at transplanting time for from 15 to 20 min. in water at 110° F. or by a 30- to 60-min. exposure to vapor heat at 110°. Successful control of mites depends upon aseptic methods to prevent reinfestation. Gerbera varieties differ in tolerance to treatment from 25- to 40-min. immersion in water or from 60- to 120-min. exposure to vapor heat. The most resistant varieties were severely injured or killed by 30-min. immersion in water at 116° for control of the root-knot nematode *Heterodera marioni* (Cornu). Chemical dips for disease control were generally injurious when used in conjunction with heat treatment for mites.

The control of sheep ticks, W. L. Stewart (*Jour. Roy. Agr. Soc. England, 97 (1936), pp. 81–95, pls. 2, figs. 4*).—This contribution deals with the castor-bean tick, which constitutes a serious menace to sheep rearing in upland areas of England through the transmission of louping ill and tick-borne fever and is responsible for much wastage in lambs due to septic infections. A new antitick dip consisting of an arsenic-carbolic mixture, incorporating a natural greasy compound and used at a strength of 0.17 percent arsenious oxide, was tested and appeared to act as a deterrent against reinfestation. It is suggested that this dip may be used to control ticks without unduly upsetting the ordinary routine of sheep management.

Ticks infesting domestic animals in Southern Rhodesia, R. W. Jack (*Rhodesia Agr. Jour., 33 (1936), No. 12, pp. 907–929, figs. 3; 34 (1937), No. 1, pp. 25–37*).—A revision of an earlier account (E. S. R., 59, p. 777), including the life history, habits, relation to animal diseases, and measures employed for tick control.

ANIMAL PRODUCTION

The American Society of Animal Production: Record of proceedings of the thirty-first annual meeting, November 25–27, 1938 (*Amer. Soc. Anim. Prod. Proc., 31 (1938), pp. 380, figs. 34*).—This is a report of the annual meeting held at Chicago in 1938 (E. S. R., 79, p. 664). The following papers were presented before the dairy cattle, horses and mules, beef cattle, swine, sheep and wool, meats, and nutrition sections:

One Cause of Fat Variation in Milk, by E. B. Powell (pp. 40–47); Effects of Climatic Factors on Livestock, by F. R. Edwards (pp. 48–53) (Ga. Expt. Sta.); The Distribution of Elements of Fertility Between Feces and Urine in Dairy Cattle, by K. E. Harshbarger and W. B. Nevens (pp. 58–61) (Univ. Ill.); Effect of Decreased Body Reserves of Vitamin E on the Reproduction of Goats, by G. K. L. Underbjerg, B. H. Thomas, and C. Y. Cannon (pp. 62–67) (Iowa); A Discussion of Winter Feeding of Kentucky Thoroughbreds, by G. D. Buckner, E. S. Good, and A. Harms (pp. 73–76) (Ky.); Progress Report—Work Stock Project in the State of Georgia, by M. P. Jarnagin (pp. 83–86) (Univ. Ga.); Carotene Requirements for Fattening Beef Cattle, by J. H. Jones, J. K. Riggs, G. S. Fraps, J. M. Jones, H. Schmidt, R. E. Dickson, P. E. Howe, and W. H. Black (pp. 94–102) (Tex. Expt. Sta. and A. and M. Col. and U. S. D. A.); Reducing the Corn and Increasing the Hay Content of Rations for Fattening Yearling Steers, by P. Gerlaugh and C. W. Gay (pp. 107–109); Creep-Feeding

March and April Calves That Are To Be Finished in Dry Lot After Weaning, by B. R. Taylor, L. E. Hawkins, and O. S. Willham (pp. 110–112) (Okla.); Ration of Sow and Response of Suckling Pigs, by A. G. Hogan, S. R. Johnson, and E. G. Gahley (pp. 112–117) (Univ. Mo.); The Relative Value of Different Levels of Alfalfa Meal in the Ration of Fall Pigs, by N. R. Ellis and J. H. Zeller (pp. 118–122) (U. S. D. A.); The Effect of Fluorine in Rock Phosphate on Growth and Reproduction in Swine, by J. M. Fargo, G. Bohstedt, P. H. Phillips, and E. B. Hart (pp. 122–125) (Univ. Wis.); Selling Hogs Based on Dressing Percentage and Carcass Grade, by L. W. Pearsall (pp. 126–130); Discussion of Selling Hogs Based on Dressing Percentage and Carcass Grade, by W. O. Fraser (pp. 130–134) (U. S. D. A.); Rough Rice and Rice Screenings Compared to Corn for Fattening Hogs, by C. I. Bray and H. P. Gayden (pp. 135–137) (La.); Comparative Value of Barley and of Different Test Weights for Feeding Hogs, by T. Wright (pp. 138–140) (S. Dak.); Blackstrap Molasses as a Partial Substitute for Corn and Oats in Fattening Rations for Swine, by C. P. Thompson and J. C. Hillier (pp. 146–149) (Okla.); Will Regional Projects Meet the Purpose of Investigation, the Demands of Industry, and Correlate the Sheep and Wool Investigational Work Satisfactorily and Effectively Within a State? by E. A. Livesay (pp. 149–152) (W. Va.); The Purpose of a Regional Sheep and Wool Investigational Program Within a State, by C. W. McCampbell (pp. 152–154) (Kans. State Col.); What the Sheep and Wool Industry Expects of Its State Experiment Stations, by L. A. Kauffman (pp. 154–158); Observation of Interstate and National Cooperation in Sheep and Wool Projects, by E. W. Sheets (pp. 158–168) (Miss.); Tenderness of Beef as Affected by Different Freezing Temperatures, by O. G. Hankins and R. L. Hiner (pp. 260, 261) (U. S. D. A.); Studies on Frozen Beef, by J. M. Ramsbottom and C. H. Koonz (p. 261); Retailers' Reactions to the Sale of Grade-Stamped Beef in Illinois, by R. C. Ashby, S. Bull, and R. J. Webb (pp. 262–267) (Univ. Ill.); The Effect of Aging on the Moisture and Salt Distribution in Cured Lamb Legs, by A. K. Besley and R. L. Hiner (pp. 267–271) (U. S. D. A.); Leafy Spurge as a Feed for Sheep, by F. W. Christensen, T. H. Hopper, E. A. Helgeson, and E. J. Thompson (pp. 311–316) (N. Dak.); The Accuracy of Statistical Methods for Evaluating Rations From Gain in Live Weight, by T. B. Keith and C. C. Wagner (pp. 317–320) (Pa.); The Minimum Base Value of Heat Production in Animals, by E. B. Forbes and R. W. Swift (p. 320) (Pa. State Col.); The Effects of an Atypical Blindness-Producing Ration Upon the Vitamin K and C Content of Calf Blood, by P. H. Phillips, I. W. Rupel, J. J. Oleson, and G. Bohstedt (pp. 320–327) (Wis.); Spectrophotometric Examination of Cattle Blood for Carotene and Vitamin A, by L. L. Madsen and R. E. Davis (pp. 327–332) (U. S. D. A.); Further Studies on the Vitamin-B Complex as It Relates to Growth and Metabolism in the Pig, by E. H. Hughes (pp. 332, 333) (Calif.); The Utilization of the Nitrogen of Urea and Ammonium Bicarbonate by Growing Calves, by E. B. Hart, G. Bohstedt, H. J. Deobald, and M. I. Wegner (pp. 333–336) (Univ. Wis.); Shape of the Growth Curve as a Controlling Factor in Conformation and Anatomical Composition of the Animal Body—Swine, by C. P. McMeekan (pp. 337–341); Food Value and Metabolic Unit of Body Size, by M. Kleiber (pp. 341, 342) (Univ. Calif.); and Meat and Meat Products as Sources of Essential Dietary Factors, by C. A. Elvehjem (pp. 343–350) (Univ. Wis.).

[Livestock investigations in Alaska] (*Alaska Sta. Bul. 7 [1938], pp. 12–17, 22, 23, 28–30, figs. 6*).—Studies for which results are reported include the value of oat-and-pea silage as a sole ration for milking cows; the effect of temperature on the keeping quality of silage in a trench silo; the value of oat-and-pea

hay as a sole ration for fattening pigs; rations for dairy calves; a comparison of *stake-cured oat-and-pea hay, artificially* dehydrated oat-and-pea hay, artificially dehydrated oat-and-vetch hay, and alfalfa hay for milking cows; and a comparison of unchopped oat-and-pea hay, chopped oat-and-pea hay, and chopped wild beach hay for wintering sheep.

[Investigations with livestock in Georgia]. (Partly coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 29 (1938), pp. 40–75, figs. 4*).—Progress reports (E. S. R., 80, p. 85) are presented for the following lines of investigations: The returns secured by grazing steers on variously fertilized lowland and upland permanent pastures, various types of annual summer and winter pastures, and kudzu; the returns secured by winter grazing of corn and velvetbeans and green oats with the beef breeding herd; the production of feeder calves and veal calves; the management of brood sows and their litters; a year-round grazing system for hogs; and the returns secured from hogging off corn, runner peanuts, and sweetpotatoes. The second year's results of previously described steer fattening trials are reported in detail.

[Livestock investigations by the Nebraska Station] (*Nebraska Sta. Cir. 60 (1939), pp. 56–72, figs. 6*).—A brief résumé of outstanding accomplishments in beef cattle, swine, and sheep feeding investigations, meat quality studies, poultry feeding and management studies, and the production and manufacturing of dairy products is recorded.

Papers presented at meeting of Texas Agricultural Workers' Association, Fort Worth, Texas, January 13, 14, 1939 (*Tex. Agr. Workers' Assoc. Mtg., Papers 1939, [pp. 93–104, 110–121, 127–140, 164–166]*).—The following papers are among those presented before the annual meeting: Carotene Requirements of Dairy Cattle, by O. C. Copeland (pp. 93–97), Vitamin and Mineral Requirements of Poultry, by R. M. Sherwood (pp. 98–101), On the Way Toward Tender Meat, by S. Cover (pp. 102–104), Mineral Deficiency Studies with Lambs and Range Cattle, by J. M. Jones (pp. 110–114), Cattle Feeding Experiments, by J. H. Jones (pp. 115–117), Primitive Sheep and Their Relation to Modern Sheep and Wool Production, by B. L. Warwick and S. P. Davis (pp. 118–121), A Parade of Some Texas Swine Experiments, by F. Hale (pp. 127–130), Some Factors Affecting the Body and Texture of Texas Butter, by F. E. Hanson (pp. 131–133), and Range and Pasture Research in Texas, by R. L. Hensel (pp. 164–166) (all Tex. Expt. Sta.); and Wildlife Conservation in the Farm and Ranch Program, by W. P. Taylor (pp. 134–140) (Tex. A. and M. Col., U. S. D. A., et al.).

[Livestock and poultry investigations in western Washington], M. W. and V. L. Miller, G. E. Bearse, and C. F. McClary (*Western Washington Sta. Rpt. 1938, pp. 5, 6, 33–35, 37, 38*).—In addition to reports of investigations previously noted (E. S. R., 81, p. 255), information is presented on the influence of various cereals and oat hulls in chick rations on the incidence of cannibalism; the value of various supplements to breeding hen rations on hatchability, chick mortality, and chick growth; and the effect of packaging materials and treatments and humidity conditions during shipping on egg quality.

Factors influencing the apparent energetic efficiency of productive processes in farm animals, S. Brody. (Mo. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 3, pp. 235–251.*)—A comprehensive review, with particular reference to (1) the influence of body size on apparent efficiency of milk production, egg production, growth, and muscular work; (2) the influence of endogenous and exogenous factors on apparent gross efficiency; and (3) the principle of optimal and limiting factors in efficiency. Twenty-seven references are cited.

The distribution of orally administered arsenic in the tissues of animals, with special reference to its partition in rat blood, J. S. McHargue

and M. LYONS. (Ky. Expt. Sta.). (*Ky. Acad. Sci. Trans., 7 (1935-37), pp. 70, 71*).—The blood of albino rats, guinea pigs, rabbits, and chickens, all of which had received a ration containing 250 p. p. m. of arsenic, was found to contain 1,300, 7, 5.2, and 4 p. p. m. of arsenic, respectively. The high content in rat blood was found to be almost entirely in the cells and appeared to be chemically combined with the hemoglobin molecule.

The physiological significance of small amounts of arsenic: Effect on erythrogenesis, J. S. McHARGUE and W. K. HALL. (Ky. Expt. Sta.). (*Ky. Acad. Sci. Trans., 7 (1935-37, p. 89)*).—Preliminary studies, in which albino rats were fed a stock ration to which was added 9 p. p. m. of sodium arsenate, gave evidence that arsenic stimulates erythrogenesis in this species, although the mechanism by which stimulation occurs was not determined.

Cobalt in nutrition, B. W. FAIRBANKS. (Univ. Ill.). (*North Amer. Vet., 20 (1939), No. 3, pp. 33-38*).—A comprehensive review with 36 references is cited.

Skeletal storage of fluorine in the growing rat fed bone meals of varying fluorine content, R. J. EVANS and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 1, pp. 188-191*).—Confirming previous findings (E. S. R., 79, p. 231), it was found that bonemeal prepared from the bones of veal calves was very low in fluorine (average 20 p. p. m.), while meals prepared from mature cattle bones and commercial bonemeals ranged from 474 to 550 p. p. m. Feeding tests with rats indicated a much greater deposition of fluorine in the femurs of growing rats receiving the high fluorine bonemeals than in cases where the veal calf bonemeal was fed. There was also evidence that a part of the fluorine in the calf bonemeal was in a form not readily available for absorption and storage in the skeleton of the rat.

Chondroitin sulfuric acid as a growth factor, H. E. ROBINSON, R. E. GRAY, F. F. CHESLEY, and L. A. CRANDALL (*Jour. Nutr., 17 (1939), No. 3, pp. 227-233*).—Continuing this line of investigation (E. S. R., 81, p. 263), tests with both chicks and rats gave evidence that chondroitin sulfuric acid serves as a growth factor for this species, a 3-percent level apparently being optimal in the basal ration used. It was shown that this material is not identical with the antidermatosis factor found in rice polish filtrate.

The lactation-promoting effect of l-cystine when fed with alfalfa proteins, L. D. WRIGHT and J. R. HAAG. (Oreg. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 3, pp. 263-268, fig. 1*).—In a series of tests in which lactating rats were fed synthetic rations containing alfalfa leaf meal as the source of protein (approximately 9 percent of crude protein), the addition of 0.4 percent *l*-cystine to the ration markedly enhanced its lactation-promoting properties as indicated by the rate of growth of nursing litters of young.

Simplified rations for guinea pigs suitable for assay of the grass juice factor, G. O. KOHLER, S. B. RANDLE, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 2, pp. 154-157, fig. 1*).—In further studies (E. S. R., 79, p. 667), efforts were directed toward developing a purified ration which could replace mineralized winter milk as a basal ration in assaying for the grass-juice factor. A ration composed of dextrin, crude casein, salts, brewers' yeast, cod-liver oil, cottonseed oil, Snowdrift, and butterfat 59:18:4:6:1:2:5:5 or a similar ration in which 12 parts of lard replaced the cottonseed oil, Snowdrift, and butterfat in the above mixtures proved satisfactory for studying the grass-juice factor and also a second nutritional factor described as the stomach-ulcer factor.

Evaluation of the vitamin A potency of feeds, G. S. FRAPS. (Tex. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 9, pp. 525-527*).—

This discussion deals with the precursors of vitamin A in feeding stuffs and various methods for estimating the vitamin A potency of feeds.

Stability of vitamin B_1 of vacuum-dried animal tissues during storage, A. ARNOLD and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Food Res., 3 (1938), No. 4, pp. 367–372, figs. 2*).—Using the chick-assay procedure, fresh stocks of vacuum-dried beef kidney, beef spleen, beef lung, and hog brains were found to contain 5, 2, 2, and 1.6 International Units of vitamin B_1 per gram, respectively. Assays of these same materials after 2 years' storage in vacuum-packed cans showed varying degrees of loss in antineuritic potency. Very little loss occurred in the beef spleen, while small but significant losses ranging up to a maximum of 20 percent occurred in the other materials.

Assay of vitamin K concentrates, S. A. THAYER, R. W. MCKEE, S. B. BINKLEY, D. W. MACCORQUODALE, and E. A. DOISY (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 3, pp. 478–481, fig. 1*).—A curative method of assay of vitamin K, using chicks depleted of vitamin K reserve and based on Trevan's principles of bio-assay, is described. A unit of the vitamin is defined as that quantity which produces a clotting time of 10 min. or less in 50 percent of a group of 10 or more chicks which have been fed a diet practically devoid of vitamin K for 14 days immediately following hatching.

Conference on Cooperative Meat Investigations—State agricultural experiment stations, United States Department of Agriculture, and the livestock and meat industry, participating; Report of review committee, I, II (*[Chicago: Natl. Livestock and Meat Bd.], 1937, vols. 1, pp. [540]; 2, pp. [454], [fig. 1]*).—At the 1935 conference on cooperative meat investigations a review committee was authorized and given the responsibility for preparing reviews and summaries of both published and unpublished meat research results which had been produced by cooperating institutions since 1925. The report of this committee is now available in two mimeographed volumes, including approximately 450 abstracts. Volume 1 contains reports on methods, beef, and pork, and vol. 2 reports on lamb, grade and measurements, cookery, lard, and nutrition.

Effect of a pellagra-producing diet on Herbivora, P. B. PEARSON, H. SCHMIDT, and A. K. MACKEY. (Tex. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 3, pp. 423–425, fig. 1*).—Six lambs, from 2 to 3 mo. of age, were placed on a diet of regenerated cellulose, yellow corn, peas, unpurified casein, and dicalcium phosphate 20 : 60 : 10 : 9 : 1, with salt ad libitum and vitamins A and D supplied by percomorph oil. Aside from a temporary setback after 4 or 5 weeks on this ration, the lambs developed normally during the course of the trial. Since this diet consistently caused cessation of growth and produced pellagra-like symptoms in pigs and blacktongue in dogs, it is concluded that nicotinic acid is either not a dietary essential for lambs or that their requirements are much lower than for the above-named species.

Cattle feeding, 1937–1938, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 433 (1938), pp. 12*).—In trials involving seven lots of 2-year-old feeder cattle, the rations were designed to give information on (1) the value of cottonseed meal in a ration of shelled corn, corn silage, and oat straw; (2) the value of a ration containing ground ear corn and shelled corn; and (3) mixed protein supplements compared to cottonseed meal. A comparison of cattle receiving a basal ration of shelled corn, corn silage, and oat straw with those receiving a supplement of cottonseed meal in addition to this ration indicated that the supplement added a markedly beneficial result in gains and finish of the cattle and increased the net returns over the feed costs. A comparison of groups which received shelled corn, ground ear corn, and a mixture of shelled and ground ear corn (4:5), respectively, in addition to cottonseed meal, silage,

and oat straw indicated that the cattle on ground ear corn made more rapid gains and sold at a higher price than those receiving shelled corn, while those receiving the mixture gained more rapidly but did not reach a higher finish than those on shelled corn. Gains on hogs following the cattle and the value of pork per steer after deducting the cost of extra feed was materially higher in the shelled corn lot than the ground ear corn. A comparison of four groups receiving protein supplements of (1) cottonseed meal, (2) cottonseed meal, linseed meal, and soybean oil meal, equal parts, (3) a complex protein mixture plus minerals, and (4) the same as group 3, less minerals, indicated that the mixed supplements had only a very slight advantage over cottonseed meal alone in rate of gain or finish of cattle. Cattle receiving the complex mixture plus minerals slightly excelled the other groups in selling value.

Chemical analysis and probable cause of urinary calculi formed in a yearling bull, G. D. Buckner and E. S. Good. (Ky. Expt. Sta.). (*Ky. Acad. Sci. Trans., 7 (1935–37), p. 68*).—In the case reported autopsy of a yearling bull revealed a large number of urinary calculi in the kidneys, urethra, and bladder. Chemical tests showed that these calculi were composed mainly of ammonium magnesium phosphate with some calcium phosphate. Faulty metabolism is listed as the probable cause.

Managing farm flock sheep for greater profit in southern Idaho, C. E. Favre and T. D. Phinney. (Coop. U. S. D. A. et al.). (*Idaho Sta. Bul. 228 (1939), pp. 16, figs. 3*).—In an attempt to determine the causes for the instability of permits to graze farm sheep flocks on national forest summer range, a comparison was made of the results obtained from farm flocks grazed in cooperative bands on summer range v. yearlong farm flocks. The summer ewe losses averaged 5.3 and 3.4 percent, the summer lamb losses averaged 6.6 and 1.7 percent, the average weight of lambs produced per ewe was 57.9 and 67 lb., and the annual returns per ewe were $1.41 and $3.04 for the cooperative bands and yearlong farm flocks, respectively. The net receipts per lamb were 38 ct. greater, the receipts from wool per ewe 17 ct. greater, and the total expense of operation per ewe was $1.01 less in the farm flocks. With a yield of 3 tons of alfalfa hay per acre of irrigated land, the hay would have to sell for $8.12 per ton to equal the returns secured by grazing the eight ewes and their lambs per acre of irrigated pasture under the conditions of this test.

Changes in meat and wool characteristics resulting from the use of pure-bred mutton rams on native ewes, J. E. Foster and E. H. Hostetler (*North Carolina Sta. Tech. Bul. 60 (1939), pp. 27, figs. 9*).—Detailed studies were made of the quality and quantity of meat and wool secured from the offspring of (1) native ewes by native rams, (2) native ewes by purebred Shropshire and Hampshire rams, (3) second-, third-, and fourth-generation females from group 2 by purebred rams in each instance, and (4) purebred Hampshire ewes and rams. The first-cross ewes by both Shropshire and Hampshire rams were materially heavier, both as yearlings and when mature, and produced heavier fleeces of longer staple than the native ewes. The second crosses did not show an increase in live weight or fleece weight over the first crosses, but all showed improvement in body conformation and quality and in quality of wool. The Hampshire crosses excelled the Shropshire crosses in weight but did not show as much quality, while the Shropshire crosses excelled both in weight and quality of fleece. Purebred Hampshire lambs made most rapid gains, followed in order by Hampshire crosses, Shropshire crosses, and natives. The Shropshire crosses were much larger, deeper, and wider but not higher than the natives, while the Hampshire crosses were larger and higher but not wider or deeper than the Shropshire crosses, and the purebred

Hampshires were larger in every respect than the other breeds. The native carcasses, both lamb and mature, were markedly inferior to the others in finish, color of lean and fat, and marbling, while the Shropshire crosses slightly excelled the Hampshire crosses in these factors.

Silicon content of wool in relation to dietary silicon, A. R. PATTON (*Arkansas Sta. Bul. 375 (1939), pp. 15*).—Two groups of four Hampshire sheep each were fed rations containing 0.7 and 4.7 percent silica, respectively, over a 10-mo. experimental period, the high silica content being supplied by replacing a portion of alfalfa hay in the low silica diet with ground rice hulls. Monthly wool samples were analyzed for silica. Samples from the low silica group began at a mean level of 0.019 percent, increased to a maximum of 0.03 percent at the end of 3 mo., and then gradually decreased to 0.005 at the end of the 10-mo. period, while samples from the high silica group started at 0.024, rose to 0.072, and then declined to 0.008 percent. The relatively small differences in silica content of the samples was considered insufficient to establish any influence of dietary silica on the silicon in the wool. Silica determinations on 81 species of grasses showed a range from 0.3 to 4.9 percent.

Canned dog food as a source of energy for dogs, C. J. KOEHN. (Ala. Polytech. Inst.). (*Vet. Med., 34 (1939), No. 2, pp. 108–111, figs. 2*).—Chemical analyses of 23 samples of commercial canned dog feeds showed a range from 1.3 to 4.9 in nutritive ratio and from 0.77 to 3.31 calories per gram in total calorific value. A feeding trial in which 7 brands of canned feeds were each fed as a sole diet to American foxhound pups over a 26-week experimental period showed that the average daily consumption of feed per pup ranged from 3.1 to 4.8 lb. Three of these brands proved to be a complete diet, 1 was deficient in vitamin D, 1 deficient in calcium, and 2 were of extremely poor nutritional quality. Young pups required about three times as much feed per unit of body weight as the same individuals at maturity, and the body requirements of bitches were approximately doubled during lactation. In practically all cases, specific feeding directions on the package failed to recommend sufficient amounts to meet the total nutritive requirements of dogs.

The utilization of the energy of feed by growing chickens, G. S. FRAPS and E. C. CARLYLE (*Texas Sta. Bul. 571 (1939), pp. 44*).—Productive energy of a basal mixture of feed based on 11 experiments involving 256 chicks is reported. Representative chicks were analyzed at the beginning of the test, and all chicks were analyzed for protein and fat at the end of the test. The gains in energy of the chicks, the quantity of feed consumed, and the length of the feeding period gave data from which the maintenance requirement of the chicks and the productive energy of the feed were calculated. Individual chicks varied appreciably in their capacity to grow and to utilize feed. Maintenance requirements and productive energy, calculated on the assumption that maintenance requirement varied according to live weight, varied less and were in closer agreement with values reported by other investigators than when calculated on the assumption that maintenance requirement varied according to the surface area of the bird. The average maintenance requirements of chickens from 28 to 42 days old was 74.8 gm. of total feed, 63.3 gm. of effective organic constituents, 48.7 gm. of effective digestible nutrients, 134 calories of productive energy or 200 calories of metabolizable energy. The ration averaged 1.79 calories of productive energy per gram of feed, 2.14 calories per gram of effective organic constituents, and 2.77 calories per gram of effective digestible nutrients, and 67.6 percent of the calories of metabolizable energy over maintenance was used for productive purposes. An average of 25.8 percent of a limited (about one-half) ration and 42.1 percent of a full-fed ration was used for gain in weight.

The utilization of food elements by growing chicks.—VII, A comparison of corn and kalo in a ration for growing chicks, C. W. Ackerson, M. J. Blish, and F. E. Mussehl (*Nebraska Sta. Res. Bul. 109* (*1939*), *pp. 8*).—Continuing this series of studies (E. S. R., 81, p. 93), the effect of replacing 31 percent of ground corn in a chick growing ration by 31 percent of ground kalo was studied in a growth and body analysis experiment with newly hatched chicks, in which the feed intake of the two lots was kept identical by the hand-feeding of pelleted rations. No significant differences in rate of growth or in the percentage reduction of nitrogen, calcium, and phosphorus was evident at the end of a 6-week trial. Some instances of wing and toe picking occurred in the kalo-fed lots.

A study of the cell content of the blood of normal chickens, with special reference to comparative differential leucocyte counts made with supravital and Wright's staining technics, N. M. Twisselmann. (Univ. Calif.). (*Poultry Sci., 18* (*1939*), *No. 2, pp. 151–159, fig. 1*).—The mean values, standard deviations, and the range of variability within normal limits for total erythrocyte, total leucocyte, and differential leucocyte counts for 21 chickens, as obtained by the supravital and by the Wright method of staining, are presented and these values compared with other published values. Wide variations were found in successive differential counts of the same individual as well as between individuals, indicating the misleading conception that may be gained from a limited number of observations.

The non-fermentable reducing substance of chicken blood, J. W. Cavett (*Poultry Sci., 18* (*1939*), *No. 2, p. 150*).—To ascertain whether the relatively high normal blood sugar level in chickens was primarily due to glucose or partially to non-sugar-reducing material, the non-fermentable-reducing substance in the whole blood, plasma, and cells of 21 chickens was determined. The data presented indicate that the high blood sugar was not due to the latter substance.

The influence of bile on erosions of the chick gizzard lining, H. J. Almquist and E. Mecchi. (Univ. Calif.). (*Jour. Biol. Chem., 126* (*1938*), *No. 1, pp. 407–412*).—Extending these studies (E. S. R., 80, p. 90), it was established that cholic acid is an effective dietary supplement in the cure or prevention of erosions of the gizzard lining and that dehydrocholic acid is almost as effective, while desoxycholic acid is comparatively ineffective in this regard. A deficiency of bile or cholic acid in the chick leads to gizzard erosions.

Some observations on the skeletal development of fowl to six weeks of age, H. E. LeMasurier and H. D. Branion (*Poultry Sci., 18* (*1939*), *No. 2, pp. 114–122, figs. 4*).—Data are presented on the weekly growth rate of New Hampshire, Barred Plymouth Rock, and White Leghorn chicks which indicated that both male and female chicks of each breed grew more rapidly and were heavier at 6 weeks of age when raised in batteries with 24-hr. lighting than when raised on the floor. X-ray photographs of representative chicks from each lot indicated more extensive calcification of the skeletal tissue of the battery-reared chicks. However, this increased degree of calcification was not in relative proportion to the remainder of the body growth, resulting in a coarse heavy bone, whereas birds raised on the floor showed a very desirable skeletal growth in keeping with other body development, resulting at 6 weeks in a finely textured and finished bone. Certain questions are raised regarding the present criteria and standards for the measurements of calicification and skeletal growth.

A new factor required for growth and reproduction in the domestic fowl, J. C. Bauernfeind, A. E. Schumacher, A. Z. Hodson, L. C. Norris, and G. F. Heuser. (Cornell Univ.). (*Soc. Expt. Biol. and Med. Proc., 39* (*1938*), *No. 1, pp. 108–111*).—In trials with chicks involving the use of a heated diet

adequate in all known vitamins except the antidermatosis factor and nicotinic acid, it became evident that supplementing this diet with the above factors resulted in a significantly slower rate of growth than was obtained by feeding the unheated diet. Similarly in trials with laying hens, feeding the heated diet supplemented with the antidermatosis factor or nicotinic acid resulted in very low hatchability of eggs as compared with the unheated diet. An unidentified factor which corrected the above-described deficiencies was provided in yeast, milk, and cereals. The factor was destroyed by heating in a dry atmosphere for 36 hr. at 120° C. It appeared improbable that it was identical with the grass-juice factor or that it was of a protein nature.

The antidermatosis vitamin required for reproduction in the domestic fowl, J. C. BAUERNFEIND and L. C. NORRIS. (Cornell Univ.). (*Science, 89 (1939), No. 2314, pp. 416, 417*).—In an experiment to determine the requirements of mature chickens for the antidermatosis vitamin, the evidence obtained indicated that within the limits of this test a lack of this factor did not affect egg production or mortality but that its presence was required for hatchability or reproduction. Hens receiving the heated experimental diet deposited less of the antidermatosis vitamin in their eggs than hens fed a normal diet, as indicated by the relative susceptibility of their chicks to a deficiency of this factor.

Vitamin A requirements of laying hens, H. J. ALMQUIST and E. MECCHI. (Univ. Calif.). (*Poultry Sci., 18 (1939), No. 2, pp. 129–137*).—Six groups of hens of tested egg-producing ability were maintained on experiment for 1 yr. (July 9 to July 9). The basal ration for the various groups was supplemented as follows: 1, check; 2, 3, and 4, carotene in oil to supply 1,800, 3,600, and 7,200 International Units of vitamin A; and 5 and 6, shark-liver oil to supply 1,800 and 3,600 I. U. of vitamin A per pound of ration, respectively. Data are reported on the feed consumption, percentage mortality, egg production, hatchability of fertile eggs, vitamin A storage in the livers of hens at the end of the trial, and the growth rate and survival of chicks for the 6 groups. The lower level of carotene feeding proved inadequate for satisfactory hatchability, while an equal level of vitamin A units supplied by shark-liver oil allowed satisfactory hatchability. Rat assays at the end of the trial indicated that the carotene supplement had lost approximately one-third of its original vitamin A activity. A ration containing the lower level of shark-liver oil calculated to contain 2,027 I. U. of vitamin A per pound of feed appeared to represent about the minimum dietary level of vitamin A, which was satisfactory for all purposes. These results, along with recent findings of other investigators, led to the conclusion that about 2,500 I. U. of vitamin A per pound of feed may be considered as a minimum practical recommendation for poultry feeding.

The availability of manganese in avian digestion, H. S. WILGUS, JR., and A. R. PATTON. (Colo. Expt. Sta.). (*Science, 89 (1939), No. 2313, p. 393*).—A series of in vitro experiments which consisted of precipitating calcium phosphate from solutions containing calcium, phosphate, and manganous ions in known amounts approximating the concentration which produces perosis in chicks gave evidence that the manganese was carried down quantitatively by the calcium phosphate precipitate. Similar results were obtained by precipitating ferric chloride solution containing manganous ions. These results were substantiated by in vivo experiments using White Leghorn pullets by showing that manganese in the digestive tract, in the excreta, and even in the feed was rendered markedly less diffusible by the use of excessive amounts of bonemeal. These findings support the hypothesis that the perosis-producing action of calcium phosphate and ferric citrate is at least partially due to the removal

of manganese from solution in the intestinal tract either by adsorption or chemical combination.

Assimilation and storage of manganese in the developing embryo and growing chick, W. D. Gallup and L. C. Norris. ([N. Y.] Cornell Expt. Sta.). (*Poultry Sci., 18 (1939), No. 2, pp. 99–105*).—A study of the assimilation of manganese by the developing chick embryo revealed that approximately 75 percent of the manganese in the egg was taken up by the embryo during incubation. The greatest concentration of manganese per unit of dry weight occurred at the ninth day (0.613 mg. per 100 gm.), while the most rapid accumulation of manganese occurred between the ninth and fifteenth days of incubation. In growing chicks, both on the low-manganese and manganese-supplemented diets, the absolute amount of manganese increased during the first 5 days, but no further increases occurred until about the twenty-fourth day. There was considerable decrease in the manganese content of the livers of the former lot during the first 5 days, followed by a slight increase, while that of the latter group remained quite constant. Depletion of liver stores did not occur until the chicks were over 6 weeks of age, after which the liver content was roughly in proportion to the manganese intake. The manganese content of the bones declined rather rapidly, particularly in the former group, indicating that the manganese requirement of the liver is met first and that of the bones second.

Some effects of manganese on eggshell quality, M. Lyons (*Arkansas Sta. Bul. 374 (1939), pp. 18, figs. 6*).—A detailed study was made of the eggshell quality of approximately 5,200 eggs produced by six pens of pullets receiving rations varying in amounts and sources of manganese and containing varying amounts of calcium and phosphorus. Pullets fed low manganese rations (7 p. p. m.) with either high or low levels of calcium and phosphorus produced eggs with distinctly different and inferior shell characteristics than those fed adequate amounts of manganese. When a number of pullets on the manganese-deficient diets were changed to manganese-adequate diets, a rapid and marked improvement in shell quality occurred, while pullets changed from adequate- to deficient-manganese levels showed an even more rapid decrease in eggshell quality. Rations containing 27 p. p. m. of manganese proved inadequate in some cases for the production of high quality eggshell, while 57 p. p. m. appeared entirely adequate. Manganese supplied in rice bran appeared equally as effective as manganous sulfate. Normal eggshells contained less than 0.00002 percent manganese.

Comparative nutritive value of firm and watery egg albumen, N. B. Guerrant and W. J. Rudy. (Pa. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 2, pp. 166–169, fig. 1*).—Two series of rat feeding tests, in which dried whole eggs containing varying proportions of firm and watery albumen plus calcium carbonate ad libitum constituted the sole diet, gave evidence that there is no significant difference in the nutritional value of firm and watery egg albumen.

A study of the effect of green feed upon interior egg quality, R. C. Ringrose and C. L. Morgan. (S. C. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 2, pp. 125–128*).—A determination of the height of firm albumin, percentage of firm albumin, and yolk index of eggs produced by comparable pens of White Leghorn pullets confined and allowed access to green feed, respectively, indicated that the presence of green feed in the ration did not affect the quality of the eggs.

Effect of high temperatures for short periods on the quality of infertile eggs, M. W. Olsen. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 2, pp. 123, 124*).—Three comparable lots of infertile eggs were incubated at 90° F. for

24 hr., incubated at 100° for 18 hr., and unincubated, respectively, and then stored at 35°. At the end of 7 days the loss in weight and the percentage of thick and thin albumin were determined for each lot. Only slight differences occurred in percentage moisture loss for the different lots. The eggs contained an average of 53, 52, and 61.5 percent of thick albumin, respectively, after storage, but aside from this variable condition the incubated eggs kept as well in storage as did the control eggs.

The care of layers in batteries, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 197 (1939), pp. 29–34, figs. 3*).—Feeding and watering equipment for laying battery installation, rations for layers in batteries, and methods of feeding are each briefly discussed. A comparison of the livability and egg production of pullet layers in batteries v. similar pullets in floor pens (average 25 trials) indicated a lower percentage of mortality and an average of 7 eggs per bird greater production in favor of those in batteries.

DAIRY FARMING—DAIRYING

Early cut artificially dried hays for dairy cows, O. M. Camburn and C. H. Jones (*Vermont Sta. Bul. 446 (1939), pp. 8*).—In further studies (E. S. R., 74, p. 677), various artificially dried young immature roughages were used to replace grain in the ration of milking cows. The results of two trials indicated that cows receiving corn silage and a full allowance of the artificially dried grass hay but no grain produced milk as efficiently as when fed silage, a limited quantity of the same quality hay, and a half allowance of grain, thus indicating the possibility of lessening production costs through the feeding of such high quality hays.

Physiology of dairy cattle, I, II (*Jour. Dairy Res. [London], 10 (1939), No. 1, pp. 133–164*).—Continuing this series (E. S. R., 78, p. 689), part 1, Reproduction and Lactation, by J. A. B. Smith (pp. 133–152), and part 2, Nutrition, by S. Morris (pp. 153–164), give comprehensive reviews of recent developments within these specific fields of dairy science. References to the literature include 171 citations in the first review and 109 in the second.

Glucose infusion through the external pudic artery, W. E. Petersen and W. L. Boyd. (Minn. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 3, pp. 537–539*).—Following previous attempts to influence lactose secretion by intravenous or intramammary duct injections of sugar (E. S. R., 75, p. 832), isotonic solutions of glucose were introduced into the external pudic artery. No consistent increases in lactose content of the milk occurred after such infusions of sugar, leading to the conclusion that the lactose content of milk is not increased by increasing the glucose content of the arterial blood.

The energy content of goat milk, V. E. Peterson, C. W. Turner, and N. P. Ralston. (Mo. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 3, pp. 293–301, figs. 3*).—The energy value, fat, nitrogen, lactose, inorganic and total phosphorus, and total solids are reported for 18 samples of goat's milk collected at various stages of lactation. One lb. of 4-percent goat's milk contained an average energy value of 342.28 calories. Energy value could be estimated with considerable accuracy from the percentages of protein, lactose, fat, or total solids. Within a fat range of 3.5 to 5.5 percent the equation $y=9.564x+39.618$ gave the energy value with considerable accuracy, and when the percentage of total solids was known the equation $y=7.085x-21.682$ gave very accurate estimates of energy values.

Studies of lipase action, I–III. (Cornell Univ.). (*Jour. Dairy Sci.*, *22* (*1939*), *No. 3*, *pp. 127–152*, *figs. 21*).—Three phases of this study are reported.

I. *Lipase action in normal milk*, B. L. Herrington and V. N. Krukovsky (pp. 127–135).—By determining the free fatty acids in the fat phase of numerous individual cow and mixed milk samples, it was found that the fat lipolysis occurred in practically all raw milk samples. Milk from different cows showed a narrow range in the acidity of the fat at the time the milk was drawn from the udder, but after a few hours wide variations occurred. An appreciable increase in free fatty acids occurred between the time of afternoon milking and the time of delivery to a pasteurizing plant the following morning. Rapid cooling tended to retard the rate of lipase action. It appeared that milk contains two lipases, one of which was completely inhibited by a very small amount of formalin while the other was not significantly inhibited by moderate amounts of formalin.

II. *The activation of milk lipase by temperature changes*, V. N. Krukovsky and B. L. Herrington (pp. 137–147).—Further studies indicated the pronounced effect of temperature changes on lipolytic activity. Lipolysis in cold milk was accelerated by warming the milk slightly and recooling, and within the temperature range studied the length of time milk was held at the precooling temperature or at the activating temperature was of less importance than the actual temperatures employed. Maximum activation was obtained by precooling to 5° C., rewarming to 30°, and then recooling to below 10°. Milk which had been activated could be reactivated or deactivated by suitable heat treatment.

III. *Lipase action in the milk of individual cows*, B. L. Herrington and V. N. Krukovsky (pp. 149–152).—A study of lipolysis in the milk of 61 individual cows showed much variation in the rate of lipolytic action and in the response of different samples to activation by warming and cooling. However, no correlation could be established between rate of lipolysis and stage of lactation, stage of gestation, or level of milk production. Most samples contained both the formalin-tolerant and formalin-sensitive enzymes, although the ratio varied.

Studies on the activated flavor of milk, J. C. Flake, K. G. Weckel, and H. C. Jackson. (Univ. Wis.). (*Jour. Dairy Sci.*, *22* (*1939*), *No. 3*, *pp. 153–161*).—Continuing this line of investigation (E. S. R., 77, p. 841), samples of milk subjected to various treatments were irradiated with a strong ultraviolet source and were tested for intensity of activated flavor development. Heating milk to temperatures above 150° to 160° F. and cooling enhanced the activated flavor when such milks were subsequently irradiated. Better results were secured when irradiation preceded homogenization when both processes were used. Altering the "salt balance" of milk failed to influence the intensity of activated flavor, while additions of nitrogen and oat flour inhibited the development of this flavor. Oxidation of milk samples tended to remove the activated flavor. Further evidence was secured to indicate that the protein fraction of milk is the parent substance of this off-flavor. The activated flavor due to the intense ultraviolet irradiation was shown to be practically identical with the burnt flavor which develops in milk exposed to sunshine.

A further study of the production of milk of abnormal composition by cows free from udder streptococci, E. G. Hastings and B. A. Beach. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 7*, *pp. 543–556*).—The observations reported in a previous paper (E. S. R., 77, p. 386) regarding the production of abnormal foremilk by cows free from udder streptococci have been extended during the second lactation for some of these animals. Of the 13 animals studied further, 9 which produced abnormal milk during the first lactation were abnormal in the second, while the 4 animals which had normal histories during the first lactation were normal during the second. No more

definite statement as to the cause of this disturbance or the transmissibility of its cause can be made as a result of the further study. The disturbance tended to continue from one lactation to another in the same quarters. It also tended to decrease production and to shorten the production period and to provide a more favorable udder environment for the establishment of streptococci. Its influence on the composition of milk was generally slight.

Productivity of media containing milk for recently isolated strains of the coliform group, M. T. Bartram and L. A. Black. (Univ. Md.). (*Jour. Bact., 37 (1939), No. 4, pp. 371-375*).—Two strains each of *Escherichia*, *Aerobacter*, and intermediates isolated from raw milk were inoculated into five liquid and seven solid media in addition to standard lactose broth and standard methods agar. The productivity of the liquid media in order of descending sensitivity was (1) methylene-blue bromocresol purple, (2) fuchsin lactose, (3) brilliant-green bile, (4) formate ricinoleate, and (5) Eijkman medium. None of these proved as productive as standard lactose. The productivity of the solid media ranked as follows: (1) Neutral-red bile, (2) violet-red bile, (3) Endo, (4) brilliant-green lactose bile, (5) lactose taurocholate, (6) desoxycholate, and (7) trypaflavine agar. Counts obtained on neutral-red bile and violet-red bile were considerably higher than those on standard agar plus milk.

The occurrence of Streptococcus zymogenes in the intestines of animals, F. R. Smith. (Univ. Calif.). (*Jour. Dairy Sci., 22 (1939), No. 3, pp. 201, 202*).—The isolation of *S. zymogenes* from the feces of the horse and the cow is reported. The fact that this organism appears to be a normal inhabitant of the bovine intestine is of significance in connection with its occasional occurrence in milk.

Controlling milk pasteurization efficiency through the use of the phosphatase test, A. J. Hahn and P. H. Tracy. (Univ. Ill.). (*Jour. Dairy Sci., 22 (1939), No. 3, pp. 191-200, figs. 2*).—A study of the applicability of the Scharer modification of the phosphatase test for determining the efficiency of pasteurization of milk gave evidence that variations of 1° F. temperature or 5 min. in the holding period or the addition of 0.1 percent raw milk to the pasteurized sample could be detected by this technic. Homogenization had no effect on the phosphatase enzyme, and the use of mercuric chloride as a preservative did not affect the accuracy of the phosphatase test. A photoelectric method for more accurately determining color values in the test is described.

The present status of the resazurin test, J. M. Frayer (*Vt. Dairy Plant, Oper. and Mgrs. Assoc., Short Course Conf. and Ann. Mtg., 17 (1938), pp. 5-14*).—A summary essentially confirming an earlier report by the author (E. S. R., 79, p. 531).

"Summit" folding milk-sampling plunger, W. R. Black et al. ([*Gt. Brit.*] *Min. Agr. and Fisheries, Agr. Mach. Testing Com. Certif. and Rpt., 70 (1939), pp. 6, fig. 1*).—A folding-type milk-sampling plunger is described. Advantages of this device as determined at the National Institute for Research in Dairying are (1) high efficiency of mixing milk for sampling, (2) convenience of handling during the process of plunging, (3) ease of cleaning, and (4) portability.

Accounting for butterfat, E. O. Herreid (*Vt. Dairy Plant Oper. and Mgrs. Assoc., Short Course Conf. and Ann. Mtg., 17 (1938), pp. 27-32*).—Various factors affecting the estimation of butterfat by the Babcock method are discussed.

A skunk-like odor of bacterial origin in butter, T. J. Claydon and B. W. Hammer. (Iowa Expt. Sta.). (*Jour. Bact., 37 (1939), No. 3, pp. 251-258*).—In a series of unsalted butter samples held at 21° C. to test keeping quality, three samples from a single plant developed a skunk-like odor after from 2 to 4

days in storage. When pasteurized sweet cream was inoculated with the defective butter and churned at pH values ranging from 5.0 to 7.5, this defect was reproduced. The causative organism was isolated and its morphology and cultural characteristics are described. The name *Pseudomonas mephitica* is suggested for it. Salt had an inhibiting effect on the production of this defect, but thorough working of the salted butter was necessary to prevent its appearance. Inoculating the butter wash water with this organism reproduced the defect in unsalted butter.

A soft cheese of the Bel Paese type, R. R. FARRAR (*U. S. Dept. Agr. Cir. 522 (1939), pp. 19, figs. 14*).—This circular presents detailed directions for manufacturing, curing, and wrapping of Bel Paese type cheese, with information on its composition, keeping qualities, appearance, and other characteristics.

Dextrose in commercial ice-cream manufacture, W. J. CORBETT and P. H. TRACY (*Illinois Sta. Bul. 452 (1939), pp. 345–380*).—A series of studies was conducted to determine the adaptability of dextrose for use in commercial creams, the effect of dextrose on certain physical and chemical properties of the ice cream mix, and consumer preference for part-dextrose v. all-sucrose ice cream. In most instances one-fourth of the sucrose was replaced by dextrose. The dextrose imparted more color to the mix, slightly lowered the pH, and decreased the mix viscosity. At this level dextrose did not affect the time required to freeze or whip the mix, and the optimum drawing temperature was about 1° lower than for the all-sucrose. There was little difference in the body and texture of the two ice creams when frozen in batch freezers, but when the continuous freezer was used the amount of stabilizer in the dextrose mix had to be reduced to avoid a sticky body. The dextrose ice cream melted somewhat faster at room temperature, and a lower dipping temperature was preferable for this product than for the sucrose ice cream.

Studies on members of the Escherichia-Aerobacter group isolated from Kansas ice cream, F. E. NELSON, B. F. DIAMOND, and W. J. CAULFIELD. (Kans. State Col.). (*Jour. Bact., 36 (1938), No. 5, p. 568*).—A high percentage of ice cream samples tested gave positive results for the presence of the *Escherichia-Aerobacter* group of organisms. When these positive samples were subjected to the phosphatase test for pasteurization efficiency about one-fourth were positive to both tests while three-fourths were phosphatase negative, indicating contamination after pasteurization or the presence of resistant strains. All organisms of this group were killed by 30 minutes' exposure at 142° F. with skim milk as the suspension medium, but 12 *Escherichia* survived the exposure when suspended in ice cream, suggesting the need of higher pasteurization temperatures for ice cream than for milk.

Some properties of milk powders, with particular reference to sweet buttermilk powders, R. N. DAVIS. (Univ. Ariz.). (*Jour. Dairy Sci., 22 (1939), No. 3, pp. 179–189*).—Twenty samples of various kinds of milk powders manufactured under known conditions were studied with reference to acidity, moisture, solubility, fat content, and hygroscopic properties. A low moisture content was shown to be essential to good keeping quality. Powders produced by the drum-dryer process absorbed less moisture than those produced by the spray process. Moisture absorption varied indirectly with the fat content of the powder. Skim milk powder absorbed less moisture than sweet buttermilk powder, which in turn absorbed less than sour buttermilk powder. The sour buttermilk powder also retained more moisture than the sweet under desiccation. Moisture equilibria levels of different powders at various humidity levels are indicated. Spray-process sweet buttermilk powders were practically all dispersible in water at 135° F., and the original dispersibility was retained for prolonged periods when powders were held in a desiccator. Small amounts

of acid in the buttermilk lowered the dispersibility of the resultant powder. Buttermilk powders held at refrigeration temperature had a higher dispersibility after 1 yr. of storage than those held at room temperature. High storage temperatures also encouraged discoloration of the powders.

Detecting thermophilic contamination in skim-milk powder, C. M. SORENSEN (*Food Res., 3 (1938), No. 4, pp. 421–427*).—In attempts to overcome the difficulty from undissolved powder and heat-coagulable material encountered when water dilutions of skim milk powder were plated for bacterial counts, tests were conducted using N/60 sodium or lithium hydroxide as dilution media in place of distilled water. An average for 15 samples of skim milk powder showed that slightly greater thermophilic spore counts were observed on plates made from these N/60 alkali dilutions than from water dilutions of the same powder, and a difficulty in counting due to undissolved flakes and specks was eliminated in the former method. Definite advantages in using the alkali dilution media were secured also when plating skim milk powder on dextrose-tryptone agar containing bromocresol purple, since the pH of average milk powder solution is sufficiently low to impair the usefulness of the indicator in detecting acid colonies when ordinary water-dilution methods were employed.

Certain practical aspects of the use of paper milk containers, P. H. TRACY. (Univ. Ill.). (*Jour. Milk Technol., 1 (1938), No. 3, pp. 40–42*).—The type of paper milk container which is formed and paraffined immediately before filling is discussed with respect to its advantages and disadvantages over glass bottles and to consumer reaction as based on 221 complete questionnaires returned by milk customers on the university milk route. The majority of users preferred the paper to the glass from a sanitary point of view and because the paper containers took up less space in the refrigerator and were more convenient for picnics. The glass bottle was preferred for greater ease of pouring and separating the cream from the skimmed milk. Few thought there was any difference in the flavor of the milk, its keeping quality, its tendency to freeze, or the rate of temperature rise. A slight majority preferred the paper container to the glass when the milk was sold for the same price, but at 1 ct. less, 75 percent preferred the paper container.

VETERINARY MEDICINE

Livestock diseases and sanitation (*Nebraska Sta. Cir. 60 (1939), pp. 52–55, fig. 1*).—A brief discussion of the work of the station since its organization.

An improved method for testing antiseptic dusting powders, J. H. BREWER (*Jour. Bact., 37 (1939), No. 4, pp. 411–413, fig. 1*).—A description is given of the simple method of testing antiseptic dusting powders which closely simulates the actual conditions of use. It requires the additional use of masks made from 3 x 5 filing cards and a small piece of fine mesh gauze. "This test eliminates false results due to concentration of essential oils, standardizes the zone of application of the dusting powder, and thereby unifies the results for comparison."

Oat hay poisoning, W. B. BRADLEY, O. A. BEATH, and H. F. EPPSON. (Univ. Wyo.). (*Science, 89 (1939), No. 2312, p. 365*).—Preliminary investigations indicate that the toxicant found in oat hay or oat straw that is occasionally responsible for the poisoning of cattle in western Wyoming is formed during the oat-plants development.

Nitrate as the cause of oat hay poisoning, W. B. BRADLEY, H. F. EPPSON, and O. A. BEATH. (Wyo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 541, 542*).—Experiments conducted indicate that potassium nitrate may be the cause of oat hay poisoning in livestock.

Is there always poison in sorghum × Sudan grass crosses? C. F. ROGERS, W. L. BOYD, and A. H. LARSON. (Univ. Minn.). (*North Amer. Vet., 19 (1938), No. 6, pp. 30–32, figs. 2*).—The authors are led to conclude that the danger from hydrocyanic acid poisoning might be increased if sorghum were crossed with Sudan grass. This, however, would not result unless the cross be made with true sorghum plants or plants shown to have an increased hydrocyanic acid content.

The anaerobic bacteria and their activities in nature and disease: A subject bibliography, I, II, E. McCOY and L. S. McCLUNG (*Berkeley: Univ. Calif. Press, 1939, vols. 1, pp. XXIII+295; 2, pp. XI+602*).—Volume 1 of this work consists of a chronological author index and volume 2, a subject index. The material assembled in the two volumes consists of approximately 120,000 entries from about 10,500 original journal articles, monographs, or other published reports. Most of these have been examined in the original and scanned for reference to the appropriate subject sections. The arrangement of material in volume 2 is as follows: Habitat or occurrence (pp. 1–38), culture methods (pp. 39–56), morphology (pp. 56–63), metabolism (pp. 63–81), products of metabolism (pp. 81–103), physiology (pp. 104–130), serological studies (pp. 131–169), disease relations (pp. 170–398), classification (pp. 399–574), and special lists (pp. 575–585).

Observations of anaplasmosis as it occurs in Puerto Rico, H. L. VAN VOLKENBERG. (P. R. Expt. Sta.). (*Vet. Med., 34 (1939), No. 4, pp. 234–236*).

Chronic arthritis in wild mammals, being a description of lesions found in the collections of several museums and from a pathological service, H. FOX (*Amer. Phil. Soc. Trans., n. ser., 31 (1939), No. 2, pp. [1]+73–148, pls. 12, figs. 2*).—Report is made of an analysis of more than 1,700 skeletons and autopsies of wild animals which reveals in the joints changes that correspond with chronic arthritis in man. Not only has this been discovered in specimens exhibited in menageries but also in material that was certainly in its proper wild habitat when killed. The lesions of these "truly wild" animals are entirely comparable to those from captive specimens, and it is evident, therefore, that chronic arthritis occurs in nature. There is no apparent relationship between arthritis and taxonomic position, zoogeography, ecology, habits, diet, pathological panels, and focal infection. There is a strongly suggested similarity between the arthritis of the lower mammals and that of the deforming and rheumatoid arthritides in man.

Heterophile antigenicity of Brucella abortus, D. F. HOLTMAN. (Ohio State Univ.). (*Jour. Bact., 37 (1939), No. 2, pp. 231, 232*).—In the course of experimentation, the authors found evidence that certain strains of *B. abortus* can stimulate in rabbits the formation of antibodies capable of agglutinating or hemolyzing sheep red blood cells. "Two cultures of *B. abortus*, isolated from supraspinous bursitis in horses, possessed this property even after 100 transfers on an agar medium free of heterophile antigen. Two cultures isolated from cattle failed to demonstrate heterospecificity, although a third culture of bovine origin, after several years of growth on horse serum agar, was able to induce heterophile antibody formation in rabbits. Since the horse provides a rich source of Forssman antigen, an agent lacking in cattle, it seems probable that the heterospecificity of the bacteria was acquired not only from the living animal but also from culture media incorporating its serum."

Some observations on the phagocytosis of Br[ucella] abortus by polymorphonuclear leucocytes, F. W. PRIESTLEY (*Vet. Rec., 50 (1938), No. 53, pp. 1793–1797, fig. 1*).

Effects of sulfanilamide on Brucella melitensis, var. melitensis, abortus, and suis, E. E. MENEFEE, JR., and M. A. POSTON (*Jour. Bact., 37 (1939), No. 3, pp. 269–276, fig. 1*).—In reviewing the literature the authors have found that in all cases of brucellosis reported every patient that responded well to sulfanilamide therapy had a high agglutinin titer before the chemotherapy was commenced. The results obtained by the authors in sulfanilamide-treated guinea pigs support the clinical observations in suggesting that the bacteriostatic action allows the normal defense mechanisms of the animal to cope adequately with the invading bacteria.

Equine encephalitis in man (*Amer. Jour. Pub. Health, 29 (1939), No. 3, pp. 272–274*).—A brief review presented with a list of eight references.

The viability and immunizing value of egg-propagated laryngotracheitis virus, F. R. BEAUDETTE and C. B. HUDSON. (N. J. Expt. Stas.). (*Vet. Med., 32 (1937), No. 10, p. 457*).—Tests have shown that continued propagation of laryngotracheitis virus in eggs does not change the immunizing power of the virus.

On the hydrogen-ion concentration of myiotic wounds and its relation to the oviposition stimulus in Cochliomyia americana C. and P., E. W. LAAKE. (U. S. D. A.). (*Amer. Jour. Trop. Med., 19 (1939), No. 2, pp. 193–197, figs. 3*).—This contribution on myiasis reports on the determination of the H-ion concentration of exudates of wounds infested with the larvae of the screwworm and the apparent relationship between H-ion concentration and the oviposition stimulus of the fly. The results indicate that a certain degree of acidity is a prerequisite to the healing of a postmyiotic wound.

A study of rat pneumonia, D. BORDEN and W. L. KULP. (Conn. State Col.). (*Jour. Bact., 37 (1939) No. 3, pp. 351, 352*).—A small Gram-negative motile bacillus was isolated from the lungs and heart blood of rats in the acute stage of pneumonia. "This organism appears to be identical with *Bacillus bronchisepticus* both morphologically and biochemically. Serologically it has been determined that antigenic differences exist between the organism isolated from infected rats and known strains of *B. bronchisepticus*. The organism in question also shares certain antigenic components with an organism recently isolated by Eldering and Kendrick and temporarily named by them *B. para-pertussis*. Success has been obtained in 100 percent of the attempts to induce rat pneumonia by the intratracheal method of inoculation. The histopathology of the lungs of artificially infected rats appears to be identical with those of spontaneous cases. It has been found that the rat pneumonia organism, *B. bronchisepticus*, and *B. para-pertussis* each produce a substance which is capable of oxidizing dimethyl paraphenylene diamine hydrochloride."

Studies on rabies, P. REMLINGER and J. BAILLY (*Études sur la rage. Paris: Masson & Co., 1938, pp. 174, [fig.] 1*).—Twenty-one chapters are given in this account of rabies, with a chronological index of work conducted at the Pasteur Institute of Tangier and of Istanbul (Constantinople) from 1903 to 1937, inclusive.

Infection of chicks and chick embryos with rabies, J. R. DAWSON, JR. (*Science, 89 (1939), No. 2309, pp. 300, 301*).—Preliminary observations of chicks and chick embryos inoculated with rabies virus indicate that the chick embryo brain is an ideal medium for its propagation.

A note on the monophasic non-specific Salmonella types, D. W. BRUNER and P. R. EDWARDS. (Ky. Expt. Sta.). (*Jour. Bact., 37 (1939), No. 4, pp. 365–370*).—The authors have found the technic of Wassén, who described the method for the separation of specific and nonspecific phases based on the immobilizing effect of homologous immune serum, to be an excellent means of isolating phases of *Salmonella* which are suppressed under ordinary conditions of culture. By

its use specific phases have been isolated from all of the so-called nonspecific *Salmonella* types.

Human toxoplasmosis: Occurrence in infants as an encephalomyelitis verification by transmission to animals, A. Wolf, D. Cowen, and B. Paige (*Science, 89 (1939), No. 2306, pp. 226, 227*).—A protozoan morphologically identical with *Toxoplasma*, which was found at autopsy in lesions of an infant that had succumbed to encephalomyelitis and was transmitted to rabbits and mice, is named *T. hominis*, with the reservation that it may later prove to be identical with one or all of the animal strains.

Differences in clinical pictures of transit fever and haemorrhagic septicaemia, J. P. Pickering (*Vet. Rec., 51 (1939), No. 9, pp. 277-279*).

The epidemiology of Trichinella spiralis infestation and measures indicated for the control of trichinosis, W. H. Wright (*Amer. Jour. Pub. Health, 29 (1939), No. 2, pp. 119-127, figs. 2*).—The author is led to conclude that the role of the rat as a source of swine trichinosis has been largely overemphasized.

The cultivation of Tritrichomonas foetus in developing chicken eggs, N. D. Levine, C. A. Brandly, and R. Graham. (Univ. Ill.). (*Science, 89 (1939), No. 2303, pp. 161, 162*).—In work designed to ascertain the possibility of propagating certain protozoa in developing chicken embryos it was found that *T. foetus* actually multiplies in eggs rather than merely survives. Twenty-two serial transfers from egg to egg of bacteria-free protozoa were made over a period of about 3 mo., with a multiplication factor of about 30 at each transfer. The trichomonads were found to survive in allantoic fluid placed in cotton-plugged test tubes for several days at room temperature, but in the egg death of the embryo may be followed very shortly by mortality of the protozoa. Preliminary experiments indicate that eggs which have been incubated about 12 days are more satisfactory for cultivation of *T. foetus* than eggs incubated for shorter or longer periods. An incubation temperature of 37° C. is better than 34.5° or 39°.

Precipitins for the tuberculin proteins of acid-fast bacteria, J. McCarter, E. M. Kanne, and E. G. Hastings. (Wis. Expt. Sta.). (*Jour. Bact., 37 (1939), No. 4, pp. 461-469*).—The authors found the tuberculin proteins of the human, the bovine, and the avian tubercle bacilli to be distinguishable by the precipitin test. "The tuberculin proteins of the avian tubercle bacilli isolated from the chicken, the cow, and the hog, and the protein of the Johne's bacillus cannot be differentiated by the precipitin test. The tuberculin proteins of two so-called saprophytic acidfast bacteria, one isolated from the cow and one from the hog, are distinguishable from each other and from the proteins of the tubercle bacilli and of the Johne's bacillus. The precipitin test with tuberculin proteins as antigens is useful in identifying unknown acidfast bacteria when considered in conjuncton with cultural and pathogenic characteristics. Further purification of the protein solutions seems necessary before the precipitin test can replace other methods of identification of acidfasts."

A historical chronology of tuberculosis, R. M. Burke (*Springfield, Ill.: Chas. C. Thomas [1938], pp. VIII+84*).—In this chronology the progress of knowledge of tuberculosis in man and the domestic and other animals is presented under the headings of the ancient period (5000 B. C.–A. D. 1600), premodern period (1600–1800), and modern period (1800 to the present time). A graphic outline of the development of our knowledge of tuberculosis is given in an infolded chart. A bibliography of three pages and name and subject indexes are included.

The udder streptococci of eighteen dairy herds, J. Ferguson. (Cornell Univ.). (*Jour. Bact., 37 (1939), No. 2, p. 223*).—In a mastitis survey of 18 dairy herds containing 655 cows, which included the examination of quarter milk

samples for the presence of streptococci, 21 percent were found infected. Of the 229 cultures "isolated from as many quarters 160 (70 percent) were *Streptococcus agalactiae*, 16 (7 percent) were *S. dysgalactiae*, 25 (10.8 percent) were *S. uberis*, 13 (5.6 percent) were of other types, and on the remaining 15 cultures (6.5 percent) no tests were made. . . . In those herds in which *S. agalactiae* was present, it was the predominating organism and the infection tended to be widespread. Infections due to other streptococci apppeared to be sporadic in origin."

The effect of sulfanilamide on the streptococci in the udder of mastitis cows, H. Bauer and M. F. Gunderson. (Univ. Nebr.). (*Jour. Bact., 36 (1938), No. 5, p. 567*).—In experiments in which eight cows affected with chronic mastitis were treated with doses of sulfanilamide ranging from 0.5 to 16 oz. over a period of from 12 hr. to 22 days, the drug was found to exert a transient effect on the streptococci. As long as the drug could be detected in the milk the streptococcal count remained low and in some instances disappeared. However, as soon as the udder was cleared of the drug the streptococci reappeared in numbers as great as before treatment was begun. One of the eight cows was infected with staphylococci; the drug showed no effect on these organisms.

The bactericidal effect of sulfanilamide upon beta hemolytic streptococci in vitro, H. J. White and J. M. Parker (*Jour. Bact., 36 (1938), No. 5, pp. 481–498, figs. 4*).—"Bactericidal action upon 36 strains of β-hemolytic streptococcus recently isolated from human infections has been demonstrated with 20 mg. percent sulfanilamide in vitro at 40° C. in peptone-glucose broth and in whole blood. Preliminary results indicate that this streptococcidal action can be demonstrated in vitro with lower concentrations of sulfanilamide. Under our experimental conditions, bactericidal action due to sulfanilamide could not be demonstrated at test temperatures lower than 39°. Experimental evidence indicates that the action of sulfanilamide in vitro is delayed for at least 3 hr."

Studies of an atypical strain of Brucella abortus isolated from a naturally infected animal, E. E. Hamann and I. F. Huddleson. (Mich. Expt. Sta.). (*Vet. Med., 34 (1939), No. 4, pp. 232, 233*).—An atypical strain of *B. abortus* was found to be responsible for reactors in a herd of 50 Jersey animals, new reactors developing despite frequent testing and immediate disposal of all reactors. In vaccination work this atypical strain was found to be an intermediate rough form which does not produce an agglutination reaction in experimental laboratory animals or cattle. During 10 yr. of study it has never been found to establish itself in any species of animal.

Calfhood vaccination against Bang's disease.—I, Effect on agglutinin titres and results of first pregnancies, J. G. Hardenbergh (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 479–488*).—The subcutaneous administration to calves of so-called "strain 19 *Brucella* vaccine," prepared and furnished by the U. S. D. A. Bureau of Animal Industry, was followed by no serious systemic effects. There was local swelling and some elevation of temperature, but both of these effects were transient and subsided without incident. "Single injections of the vaccine caused a pronounced agglutinin response which usually reached a peak in about 10 days and then gradually diminished. In 80 percent of 625 vaccinated heifers whose agglutinin titers were studied, the test became completely negative within 4 to 6 mo. In about 20 percent, a low titer of 1:50, or partial in 1:100, was maintained indefinitely. These low titers have not been found to be associated with any permanent 'infection' with the strain 19 culture. Only 1 heifer in the group of 625 retained a positive blood test indefinitely. In 124 first pregnancies in vaccinated heifers, there were 7 abortions, or 5.6 percent. Only 3 of these abortions were ascribed to *Brucella* infection, or 2.4 percent of the pregnancies. In 64 first pregnancies in control heifers, there were 4 abor-

tions, or 6.2 percent, all of which were apparently due to *Brucella* infection. A number of heifers in the 1935 series developed positive blood titers due to natural exposure to infection. The disposals of this account, including positive aborters, in the vaccinated group amounted to 9.8 percent, and in the control group to 20.5 percent."

A study of hemorrhagic septicemia bacterin and Bang's disease of cattle, C. H. Kitselman and H. F. Lienhardt. (Kans. State Col.). (*Vet. Med., 32 (1937), No. 10, p. 448*).—An abstract of a contribution relating to work in which it was found that, while cattle injected subcutaneously with hemorrhagic septicemia bacterin gave rise to agglutinins for *Pasteurella* organisms, they do not give rise to agglutinins for *Brucella* organisms. In an experiment in which abortus Bang reacting cows were given hemorrhagic septicemia bacterin subcutaneously the Bang-titer of these cows was not lowered from a positive to a negative level during the 6-mo. period of observation.

An ictero-hemoglobinuria-like disease in Florida, M. W. Emmel and D. A. Sanders. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 543, 544*).—Report is made of the occurrence of a disease resembling bacillary ictero-hemoglobinuria in the station dairy herd. It is said to be the first time a disease of this type has been reported in Florida.

Some factors affecting the agglutinability of streptococci associated with bovine mastitis, W. N. Plastridge, L. F. Williams, and L. Banfield. ([Conn.] Storrs Expt. Sta.). (*Jour. Bact., 37 (1939), No. 3, p. 352*).—An abstract of a contribution presented in December 1938. All of the ingredients, especially the kind of peptone used in preparing nutrient broth, were found to have a pronounced influence on agglutinability of udder streptococci.

The cultural and clinical significance in bovine mastitis of nonhemolytic streptococci that ferment aesculin, R. B. Little (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 496–500*).—The author reports upon the results of observations on the cultural and clinical significance of group III streptococci in a small self-contained herd of cows from which the animals infected with group I streptococci had been eliminated.

Potassium permanganate reduction test for mastitis, E. R. Carlson. (Wis. Expt. Sta.). (*Vet. Med., 34 (1939), No. 3, pp. 160, 161*).—A description is given of the potassium permanganate reduction test for mastitis. Two standard solutions for making the test (M/40 and M/200) have been prepared for field and laboratory use. In the reactions of this test the depth of color is indicative of the degree of abnormality of the milk. A code for recording these reactions is also given. The test is simple, inexpensive, informative, and can be made in the field at the time of the physical examination, when the information it reveals is most useful.

Tuberculin purified protein derivative (P. P. D.) in the double intradermal test in cattle.—Preliminary observations, R. F. Montgomerie and A. Thomson (*Vet. Rec., 51 (1939), No. 8, pp. 229–236*).—A report is made upon the use of tuberculin purified protein derivative (P. P. D.) prepared from a human strain of the tubercle bacillus employed in testing 426 cattle by the double intradermal method. "It is [concluded] that P. P. D. possesses advantages over the tuberculins previously used and should be included in any future investigation of the potency of tuberculin for use in the double intradermal test. With a sufficiently potent suitable tuberculin a single injection into the skin of the neck may detect as many reactors as does the double intradermal test."

Filarial dermatosis of sheep, H. E. Kemper. (U. S. D. A.). (*North Amer. Vet., 19 (1938), No. 9, pp. 36–41, figs. 2*).—Account is given of an affection of sheep apparently due to the presence of the larval stage of *Elaeophora*

schneideri within the layers of the skin. These microfilariae were not found in healthy appearing portions of the skin of affected sheep at some distance from the visible lesions but were present in all skin lesions regardless of their location on the sheep. In 11 of 12 sheep showing characteristic skin lesions the mature worms were found in the arteries on post-mortem examination. Fuadin appeared to be specific in the treatment of the skin lesions when 88 cc. or more was injected intramuscularly in 4 cc. minimum daily doses.

Observations on the stiff lamb problem with special reference to white muscle disease, L. R. VAWTER and E. RECORDS. (Nev. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 489–491*).—The authors have found that all the diseases included under the category of stiff lambs are preventable if proper attention is given to sanitary precautions and methods of feeding and management of the ewes both prior to and after lambing. Treatment and remedial measures instituted after any of the enumerated diseases appear in a band of lambs has not proven wholly satisfactory. The term stiff lambs, as applied by sheepmen, "is a collective term actually embracing several separate diseases and infections such as those caused by *Actinomyces necrophorus*, *Corynebacterium pyogenes*, *Erysipelothrix rhusiopathiae*, *Clostridium tetani*, and 'white muscle' disease. Regardless of the nature of these diseases, one of the first symptoms noticed by sheepmen is lameness or stiffness."

Hemorrhagic septicemia in Indian buffaloes, T. TOPACIO (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 492–495, figs. 3*).—Report is made of an outbreak of hemorrhagic septicemia in Indian buffaloes, the first in this animal to have been recorded from the Philippines.

Babesia bovis Starcovici 1893 as the cause of red-water in an Indian buffalo, J. A. IDNANI (*Indian Vet. Jour., 15 (1939), No. 3, pp. 247–250, pl. 1*).—This contribution records the occurrence in an indigenous buffalo of a species of *Babesia* different from *B. bigemina*, the only form previously known to cause bovine redwater in India. It resembles *B. bovis*.

The hemoglobin content of the blood of pigs, L. H. SCHWARTE. (Iowa State Col.). (*Vet. Med., 34 (1939), No. 5, pp. 300–304, figs. 4*).—

Some tests with crystal-violet vaccine for prevention of hog cholera, B. H. EDGINGTON and A. F. SCHALK. (Ohio Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 501–509*).—In experiments reported the outstanding feature was the difference in resistance to cholera manifested by "animals in the immunity tests conducted 14 to 40 days and those made at 75 to 90 days, following vaccine administration. A summary of the results of this phase of the tests shows that, of the 36 pigs subjected to hog cholera virus injections, 14 to 40 days following their vaccine treatment, none showed reactions of questionable severity. While in a group of 46 pigs subjected to cholera exposures 75 to 90 days following vaccine treatment, 12 gave undoubtedly severe reactions and 12 others died. Pen association of 40 to 50 cholera-susceptible pigs with vaccine-treated pigs, for a period of approximately 30 days after vaccine administration, gave no evidence of spread of hog cholera infection by the vaccine-treated pigs."

Equine breeding hygiene, W. W. DIMOCK. (Univ. Ky.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 469–478*).

Experimental use of sulfanilamide in equine therapy, J. J. ARNOLD. (Mich. State Col.). (*Vet. Med., 34 (1939), No. 5, pp. 286–291*).—In experiments conducted sulfanilamide proved to be of some value in acute septicemia and less so in chronic conditions. "The findings did not disprove the possibility that it may have some effect in checking the spread of infection and preventing complications. The drug appeared to be relatively nontoxic in repeated small doses, or in single large doses, but to have a cumulative effect in some cases

when large doses were repeated. Reduction of body temperature appeared to be a frequent effect of the administration of sulfanilamide, although in some cases repeated heavy doses resulted in an abrupt rise of temperature."

Aujeszky's disease, P. REMLINGER and J. BAILLY (*La Maladie d'Aujeszky. Paris: Masson & Co., 1938, pp. [3]+204, figs. 16*).—This monographic account is presented in 15 chapters and includes a bibliography of 6 pages.

Infectious equine encephalomyelitis, J. FARQUHARSON. (Colo. State Col.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 459–465, figs. 3*).—This discussion of symptoms, treatment, and prevention of equine encephalomyelitis is based upon work in Colorado, which State has escaped the disease in only 1 yr. since 1932. The use of chick-embryo vaccine has been found highly effective as an immunizing agent, not only as a preseasonal vaccination but also during an epizootic.

The pathology of eastern equine encephalomyelitis in the guinea pig, L. S. KING (*Amer. Jour. Path., 14 (1938), No. 5, pp. 636, 637*).—An abstract of a contribution in which special attention was paid to the pathological findings of the central nervous system in the early stages of the disease before symptoms were apparent and in which it was found that the virus passes directly from the blood into the brain tissue. The presence of lesions in the cerebral cortex with intact subcortical centers was held to exclude nerve transmission. Under certain conditions the virus may travel along nerve paths.

Equine encephalomyelitis virus (eastern type) isolated from ring-necked pheasant, H. VAN ROEKEL and M. K. CLARKE. (Mass. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 466–468*).—Equine encephalomyelitis was observed in two ring-necked pheasants received from the New Jersey Stations and identified as due to the eastern type of the virus. The English sparrow was shown by experimental inoculation to be highly susceptible to the virus, and is added to the list of hosts that may contract the disease.

Pyaemia in foals caused by Corynebacterium equi, H. MAGNUSSON (*Vet. Rec., 50 (1938), No. 44, pp. 1459–1468, figs. 7*).—This contribution supplements the earlier account (E. S. R., 50, p. 685).

Treatment of equine strongylidosis with n-butyl chloride.—Preliminary note, P. D. HARWOOD, P. C. UNDERWOOD, and J. M. SCHAFFER. (U. S. D. A.). (*North Amer. Vet., 19 (1938), No. 7, pp. 44–46*). The drug *n*-butyl chloride, known to be effective as well as nontoxic when used as an anthelmintic against ascarids and hookworms in dogs, was tested on 3 horses. "At a dose rate of 0.1 cc. per pound of body weight (=3.5 fluid oz. per 1,000 lb.), administered in 10 times its volume of linseed oil, [it] removed more than 99 percent of the cylicostomes as well as 74 percent and 100 percent, respectively, of the *Strongylus* spp. from 2 horses. *n*-Butyl chloride used at a dose rate of 0.075 cc. per pound of body weight (=2.5 fluid oz. per 1,000 lb.), administered in 8 times its volume of linseed oil, removed 95 percent of the cylicostomes from 1 horse; this horse harbored no *Strongylus* spp. In the 3 horses tested the only symptoms observed were temporary reduction of appetite, which may have been due to excessive purgation by linseed oil, and a slight skunklike odor which appeared in the breath and emanated from the skin of the 3 subjects."

Canine distemper and vitamin A of shark liver oil, D. A. SANDERS and L. L. RUSOFF. (Fla. Expt. Sta.). (*Vet. Med., 34 (1939), No. 3, pp. 174–176, figs. 4*).—Experiments conducted have shown that vitamin A present in shark-liver oil did not protect puppies against injections of canine distemper virus. No difference was noted in the susceptibility of the control and shark-liver oil groups to injection of canine distemper virus. "The temperature curves show that all 13 puppies had a significant rise in body temperature following

exposure to distemper virus. These results are not in agreement with Frohring's,[8] in which only one pup died of 25 that received excessive amounts of vitamin A and were inoculated with an untested virus of canine distemper."

Sulfanilamide as a treatment for salmon poisoning in dogs, E. W. Coon et al. (Oreg. Expt. Sta.). (*North Amer. Vet., 19 (1938), No. 9, pp. 57–59, fig. 1*).—Report is made of the experimental treatment of so-called salmon poisoning, shown by Simms and his associates in Oregon (E. S. R., 65, p. 72) to be a fluke-borne infectious disease of dogs and other Canidae. A drop in temperature and return of the appetite followed within from 24 to 48 hr. after the first administration of sulfanilamide.

Bacteria of the Listerella group isolated from foxes, H. W. Cromwell, E. E. Sweebe, and T. C. Camp (*Science, 89 (1939), No. 2309, p. 293*).—An organism found present in an affection of silver foxes which spread rapidly through the sheds of a fox fur farm in Illinois, with resultant high mortality, and was diagnosed as that of distemper is considered by the authors to belong to the *Listerella* group.

Treatment of fox distemper, G. L. Ott (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 522–525, figs. 5*).—Experiments with several thousand animals in 1938 indicate that "the use of homologous anti-canine-distemper serum as a prophylactic agent against fox distemper is an economically sound measure."

[**Report of work in avian pathology**] (*Western Washington Sta. Rpt. 1938, pp. 6, 35–37, 38, 44–46*).—Reference is made to breeding experiments for disease resistance in chickens, by M. W. Miller, G. E. Bearse, and C. F. McClary; the use of milk flush for the control of cecal coccidiosis in chickens, a pullorum disease transmission experiment, and control of fowl pox through vaccination, all by C. E. Sawyer and C. M. Hamilton; gizzard erosions in chickens, by Sawyer, Hamilton, and L. G. Nicholson; wheat-germ oil for the treatment of fowl paralysis, by Sawyer and Nicholson; tapeworm transmission by garden slugs; transmission of leukemia; and control of coccidiosis by sanitation.

The disease factor in Illinois poultry mortality, R. Graham. (Univ. Ill.). (*Vet. Med., 34 (1939), No. 3, pp. 170–172, figs. 4*).

Brucellosis in fowls [trans. title], P. Pavlov (*Rec. Méd. Vét., 114 (1938), No. 12, pp. 790–798*).—Following a brief review of the literature, report is made of experiments conducted. Fowls inoculated were found less susceptible to *Brucella* than were mammals; the chicken was more susceptible than the pigeon. The rabbit appears to be much more susceptible to contact infection from the fowl than is the guinea pig. The organism was only present in eggs laid from 4 to 14 days after inoculation of the fowl with a *Brucella* culture. Agglutination and allergic tests are considered the most convenient and practical means of diagnosis.

The detection of carriers of fowl cholera, and its control, by means of a stained-antigen, rapid, whole-blood test, W. B. Shook and H. Bunyea. (U. S. D. A.). (*Poultry Sci., 18 (1939), No. 2, pp. 146–149*).—Report is made of an outbreak of fowl cholera due to a carrier condition of several years' standing that was controlled by use of a stained-antigen, rapid, whole-blood agglutination test of the flock, followed by removal of the reactors. The stained-antigen test agreed with the tube agglutination test on 133 reactor birds, with negative controls. The stained antigen for the rapid, whole-blood test was made from 24-hr. agar growths of an autogenous blue type culture of *Pasteurella avicida* washed off with physiological saline containing 1 percent of formalin. The

[8] Vet. Med., 32 (1937), Nos. 1, pp. 9–11, fig. 1; 2, pp. 76–82, figs. 11; 4, pp. 190–195, figs. 10; 5, pp. 234–242, figs. 15; 7, pp. 328–333, figs. 2; 9, pp. 414–417, figs. 4; 10, pp. 468–474; 12, pp. 570–574.

suspension was adjusted to a turbidity of 75×1 of the McFarland nephelometer scale and stained with 0.1 percent of crystal violet. The antigen was set aside for several days at room temperature before use.

The production of goiter in chickens, A. R. Patton, H. S. Wilgus, Jr., and G. S. Harshfield. (Colo. Expt. Sta.). (*Science, 89 (1939), No. 2303, p. 162*).—The authors report having produced goiter in chickens with a ration containing 0.145 mg. per kilogram of iodine and have prevented it by the addition of 5 mg. per kilogram of iodine to the same ration.

An experimental attempt to produce lymphomatosis in chickens by injections with Salmonella aertrycke and lymphomatous nerve tissue, with observations on the blood pictures of the chickens, J. R. Beach and N. M. Twisselmann. (Univ. Calif.). (*Poultry Sci., 18 (1939), No. 2, pp. 160–164, fig. 1*).—The results of the experiment here reported failed to show that intravenous inoculation of young chickens with lymphomatous nerve tissue or the repeated oral administration of cultures of *S. aertrycke*, either alone or in combination, caused the development of lymphomatosis or produced a hemocytoblastosis or other changes in the blood pictures of the chickens. "Several types of abnormalities of blood pictures were found in 12 or 13 chickens with lymphomatosis. These, however, did not conform to any particular trend as to their nature nor with respect to the type of lymphomatosis with which the chickens were affected. Their appearance was nearly coincident with the development of paralytic symptoms in the case of neurolymphomatosis and shortly before death in the case of visceral lymphomatosis. They are regarded as a doubtful or valueless diagnostic aid."

Is fowl paralysis infectious? A. H. Fraser (*U. S. Egg and Poultry Mag., 45 (1939), No. 2, pp. 106–110, 122, 123, figs. 3*).—Studies conducted at the Rowett Research Institute in Great Britain led to the conclusion that some infective factor which isolation tends to exclude, not worms and probably not coccidia, increases the incidence of fowl paralysis among poultry when other conditions are equalized. While the precise nature of the infective factor remains unknown, the results of 3 years' work on this disease indicate that fowl paralysis is infectious in nature.

Disease in turkeys due to Prosthogonimus macrorchis, R. W. Macy (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 537, 538, figs. 2*).—Infestation experiments indicate that the turkey is poorly adjusted to the fluke *P. macrorchis* and that this fowl is an unnatural host. "Turkeys eagerly devour dragonflies, and flocks in the vicinity of lakes may easily become exposed to the infection. Therefore, during the period of maximum dragonfly emergence, May 20 to June 20, the birds should be kept some distance from the lakes."

Pullorum disease of turkeys: Studies on incidence and carriers, W. R. Hinshaw. (Univ. Calif.). (*Vet. Med., 32 (1937), No. 10, pp. 455, 456*).—This account is based upon work conducted in California (E. S. R., 78, p. 857).

Use of iodine for gapeworms in pheasants, J. P. Delaplane and H. O. Stuart. (R. I. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 5, pp. 538, 539*).—The treatment of some 20 gapeworm-infested pheasants in a large flock by instillation of a few drops of iodine vermicide in the trachea with a pipette or eyedropper is said to have relieved the symptoms of respiratory distress after a few days. No losses from gapeworm occurred in the flock following this treatment. In 2 gapeworm-infested pheasants showing paralytic symptoms that were treated by the authors, the symptoms of respiratory distress disappeared after 4 and 5 days. Autopsies of the 2 birds later failed to reveal any gapeworms, indicating the effectiveness of this form of treatment.

AGRICULTURAL ENGINEERING

Geology and ground-water resources of the Snake River Plain in southeastern Idaho, H. T. STEARNS, L. CRANDALL, and W. G. STEWARD (*U. S. Geol. Survey, Water-Supply Paper 774 (1938), pp. IX+268, pls. 31, figs. 16*).—The chief purpose of the investigation here recorded was to obtain data regarding the source, movement, and disposal of the ground-water supply of the lava plains that occupy most of the region. By assembling and correlating numerous well records obtained in this and related investigations, tied together by a system of levels, the authors prepared a map of the region showing contours of the water table and the direction of movement of ground water in all parts of the region. This map largely indicates the source and disposal of the water. The total annual ground-water supply of the Snake River Plain is here estimated at 4,000,000 acre-ft., of which only a small part is now utilized for irrigation.

Deep well irrigation in the Oklahoma Panhandle, W. LANGHAM and W. N. MCMILLEN (*[Oklahoma] Panhandle Sta., Panhandle Bul. 64 (1939), pp. 22, figs. 6*).—The water supply in the water-bearing strata is at present large but is the accumulation of years of seepage and has no other important sources. However, "though the depletion of this water supply is possible, it seems unlikely that irrigation will become extensive enough under the present conditions of high power rates, high pumping lift, and cheap crops to make the condition very probable." The quality was found to be good, but the mean depth of water-bearing strata in Cimarron County was somewhat more than 160 ft. as against an estimate of 100 ft. as the maximum economically practicable pumping lift. Cost is found to be the limiting factor. In an example given, "when the total annual pumpage was 273 acre-ft., fixed costs accounted for 41 percent of the total cost of an acre-foot of water, including the labor. Had this well been used to pump only 100 acre-ft., the total cost per acre-foot would have been $9.53, of which approximately 66 percent would have been fixed charges. It is obvious that this item alone would make the pumping of water unprofitable regardless of the power rate. Though the item of fixed costs increases with the pumping lift, if maximum use of the plant is obtained, this item may not make cost of pumping prohibitive for pumping lifts well over 100 ft. Provided that operation costs can be minimized by an abnormally low rate of power, deep well irrigation may have some possibilities. Especially is this true in those favored areas along the creeks and rivers where the pumping lift may not be excessive. In these areas the development of natural gas resources affording a cheap source of power may even justify irrigation expansion, though it is obvious that dry-land farming must remain the basic agriculture in the entire region as a whole."

The relation of soil conditions to practicability of well irrigation, the status of four High Plains irrigation projects, general cost analyses, description of the well and pumping plant of the station, together with the cost of the well and equipment and the costs of operation, and cropping and water-handling notes are also discussed.

Sewage irrigation as practiced in the western States, W. A. HUTCHINS (*U. S. Dept. Agr., Tech. Bul. 675 (1939), pp. 60, figs. 14*).—This bulletin outlines the character of the problem in general terms and takes up in some detail sewage as a source of irrigation water supply, use of water, irrigable lands, crops, safeguards and regulations of public-health authorities, salts in sewage effluents, sewage water rights, and economic feasibility of sewage irrigation. An appendix lists areas in which irrigation with sewage taken directly from

outfalls or disposal plants is practiced, and areas using irrigation with sewage diverted from public stream channels.

It is noted that, in general, coarse-textured soils, loose in structure, have proved better suited to sewage irrigation than heavy soils of equivalent fertility, but many tracts irrigated with effluents consist of clay loams and clays. Difficulties with the heavy soils irrigated with effluents have arisen largely from lack of care and judgment in applying the water, rather than from the character of the water. The coarser-textured, lighter soils comprise two-thirds of the soil classes in the areas included in the study. Any change resulting from the use of sewage, so far as reported, was to the effect that the soil structure showed improvement. Crops irrigated with sewage are those commonly grown under irrigation in the locality. Reports generally indicate higher yields with sewage effluents than with other water applied under comparable physical conditions and with equal care.

Rural water supply and sewerage.—I, Excreta disposal and sewerage, E. W. STEEL and P. J. A. ZELLER. (Tex. A. and M. Col.). (*Tex. Engin. Expt Sta. Bul. 46 (1939), pp. 21, figs. 7*).—This bulletin consists mainly of a nontechnical discussion of the construction and operation of septic tank systems, including the function of the subsurface irrigation field, the operation of the sewage disposal system, the construction of the tank, the subsurface irrigation field, and cost estimates.

For preventing top flow straight through the tank, the authors recommend extra heavy cast-iron soil pipe tees at the inlet and outlet on the ground that tile tees are frequently broken and wooden baffles are likely to rot out.

Lumber requirements for nonfarm residential construction, F. J. HALLAUER (*U. S. Dept. Agr., Misc. Pub. 347 (1939), pp. V+39, figs. 18*).—The author found evidence of a cyclical period of about 18 yr. in the construction of nonfarm housing units and suggests a pattern for the cycle ending about 1950.

There has been a noticeable trend to brick and stucco over frame, but lumber exterior face makes up only some 10 percent of the total lumber in an all-wood house, and a partial substitution of other materials has not greatly reduced the lumber per unit. An analysis arrives at a prospective average annual requirement of 6.4 billion board feet of lumber for new residential construction and 1.4 billion board feet for repairs per annum. These estimates are based on the volume for a decade and cannot be applied to any one year. "An estimate year by year can be arrived at by applying the lumber per unit to the suggested construction cycle."

Bibliography on highway finance, compiled by L. W. HELVESTINE (*U. S. Dept. Agr., Bur. Pub. Roads, 1938, pp. [4]+95*).—In selecting the references the emphasis has been placed chiefly on the theory of highway finance. The principal objective of the list is to present a survey of literature on the various methods of financing employed today and the present trend of public practice. Articles in periodicals which present only the factual and statistical material compiled and published by the Bureau of Public Roads have been omitted from the list.

Public Roads, [April and May 1939] (*U. S. Dept. Agr., Pub. Roads, 20 (1939), Nos. 2, pp. [2]+21–44+[2], figs. 13; 3, pp. [2]+45–64+[2], figs. 15*).—These numbers of this periodical contain data on the status of various highway projects receiving Federal funds as of March 31 and April 30, 1939. No. 2 also contains an article entitled Experimental Bituminous-Treated Surfaces on Sand-Clay and Marl Bases, by P. F. Critz and W. K. Beckham (pp. 21–43); and No. 3, articles entitled Preliminary Results of Road-Use Studies, by R. H. Paddock and R. P. Rodgers (pp. 45–54, 62, 63), and A New Vibratory Machine

for Determining the Compactibility of Aggregates, by J. T. Pauls and J. F. Goode (pp. 55-61).

Methods and machinery for harvesting soybeans, J. W. Sjogren (*Virginia Sta. Bul. 319 (1939), pp. 10, fig. 1*).—The beater harvester, binder and mower, and combine harvesting methods were compared with reference to cost and efficiency.

The beater harvester, though adapted to small acreages and to harvesting soybeans planted between corn rows, caused losses of beans ranging from 20 percent under favorable conditions up to 60 per cent. The 3-yr. average loss for all tests and under the various conditions of the tests was 43 percent. As means for reducing the losses in this method of harvesting, the author suggests planting a variety with erect growth habits, ridging the rows slightly at the last cultivation, and allowing hogs to pick up the wasted seed after the harvester. The cost of harvesting soybeans with the beater harvester is about $2.11 per acre, not including the value of the wasted seed. The binder and mower method of harvesting is used when the soybeans are planted broadcast or with a drill. The ordinary grain thresher can be adjusted to thresh soybeans without excessive cracking or splitting. The speed of the cylinder should be reduced, while the speed of the grain cleaner and the straw rack should be maintained at the regular speed recommended for grain. Special soybean attachments for adjusting grain separators are extensively used. Harvesting losses with the binder and thresher were 24.7 percent of the total yield, and farmers estimated losses of from 15 to 35 percent. The total cost was $9.38 per acre, high compared with costs in other States. The combine is used extensively for soybeans planted in rows as well as drilled. The introduction of the small combine has increased its use for soybeans in Virginia. The average harvesting losses of the combine were 12.37 percent of the total yield. The combine was found to require the same type of adjustments as the grain thresher to thresh soybeans satisfactorily. Special equipment for threshing soybeans can be obtained for the combine. The cost of the small combine ranges from $500 to $900, depending on the width of cut and on the special equipment desired.

Artificial drying of farm crops in the United States: A selected bibliography, compiled by D. W. Graf (*U. S. Dept. Agr., Bur. Agr. Engin., 1938, pp. [2]+46*).—This is a classified reference list containing abstracts of some of the papers noted. The references are grouped under the following headings: Description of machines, general, apparatus, corn, cotton, forage crops, grain, miscellaneous crops (hops, seeds, copra), rice, and sugar beets. An author index is included.

Portable field drier, R. M. Hixon and A. L. Bakke. (Iowa Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 3, pp. 268–270, figs. 2*).—A partly dimensioned longitudinal section drawing, a photograph, and a brief outline of the method of construction describe a set-up 36 by 9.5 by 23 in., exclusive of the 6-v. battery which operates the blower. Air is blown into a hot water jacket compartment, baffled to prevent air channels, and is vented into four drying chambers above the heating chamber, each being baffled to force the hot air into the center of the chamber. The end compartment is water-jacketed to keep the temperature as high as possible. A steam outlet from this jacket leads to a condenser, made from an automobile heater. The condensate returns to the water bath through a copper pipe large enough to facilitate filling and to serve as blow-off. A rubber tube can be placed over the end of this vent and led to the ground to prevent wetting of the samples by escaping water. The water bath is heated with a portable gasoline camping stove.

The use of bituminous coal in the dehydration of alfalfa and other forage crops, E. R. KAISER (*Bituminous Coal Assoc. Inform. Bul. 3 (1939), pp. [1]+22, figs. 2*).—As an advantage of artificial drying, as against sun curing, it is pointed out that artificially dried alfalfa may contain about seven times as much provitamin A as do field-cured plants. "By drying the hay at less than 180° F. while in an atmosphere consisting largely of nitrogen and products of combustion, oxidation is prevented, and the nutrients, including upward of 90 per cent of the carotene, are preserved."

"The marked saving in nutrients and the improved quality of dehydrated hay as the result of artificial drying are sufficient to warrant consideration of such drying for use at large dairy and hay farms for the production of whole hay."

As some of the advantages of bituminous coal as a fuel for the artificial drying of forage crops, the author notes its cheapness, as compared with other fuels on the basis of B. t. u. output, and the facts that bituminous coal, fired by stokers, is so completely burned by proper firing that the hay is not tainted, and that the rate of heat release from the coal-fired furnace can be controlled thermostatically as with oil or gas. The cost of heating and the saving with bituminous coal can be determined for a given plant by applying a method here given and illustrated. A suggested design of stoker furnace is shown. This may be modified to suit installations of various sizes.

Cereal nursery seeders, H. M. BEACHELL. (U. S. D. A. and Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 3, pp. 265–268, figs. 7*).—The author describes a seeder adjustable for uniform seeding with test weights varying from 35 to 52 lb. per bushel when sowing 90 lb. per acre in rows spaced 1 ft. apart. Provision is made for calibration and marking to permit quick and accurate setting.

The author also describes a spacing seeder which consists of small sheet metal cups ⅞ by ¾ in. and ½ in. deep attached to each link of a No. 25 cast drive chain. The cup was made from 28 gage sheet metal cut according to a dimensioned diagram. The speed of the chain to which the cups are attached is so regulated that a seed placed in each cup is dropped every 4 in. A single seed is dropped in each cup by hand, and any extra seeds dropped accidentally in a cup are removed with forceps. It was found that two men, one filling the cups and the other pushing the seeder, can sow approximately 450-rod rows in a 9-hr. day. With two men filling the cups and a third pushing the seeder, as many as 560 rows were seeded in 9 hr.

In addition to the construction shown in the diagram of the cup for the spacing seeder, some details of each of these seeders are shown in photographs.

An instantaneous steam generator for "sterilizing" milk utensils on the farm, K. G. BEACHLEY (*Jour. Dairy Sci., 22 (1939), No. 3, pp. 169–177, figs. 4*).—The efficiency, cost of operation, and convenience of an instantaneous steam generator for the production of steam and hot water for washing and sterilizing dairy utensils were studied. The chief advantages of this equipment were compactness, speed of generating steam, small amount of labor to operate, economy of operation, and cleanliness, plus the fact that it was possible to combine chemical sterilizers with the steam in one operation and the utensils could be dried without removing them from the steam chest. The chief disadvantage was the large number of moving parts to wear and be greased, plus the fact that it did not provide for heating the milk house except by the use of radiators.

Artificial daylighting for color grading of agricultural products, D. NICKERSON. (U. S. D. A.). (*Jour. Opt. Soc. Amer., 29 (1939), No. 1, pp. 1–9, figs. 5*).—Cotton grading was found, from a study of the demands of experienced classers, to require diffuse, nearly uniform illumination over a wide

working area; color matching that of slightly overcast north sky; and an intensity of from 60 to 80 footcandles in the horizontal plane in which the work is to be done. There was little advantage in an increase to more than 100 footcandles, and it was found best to avoid intensities higher than about 150 to 200 footcandles.

In a trial of an experimental set-up of 1,000-w. lamps set about 2 ft. apart from center to center, provided with "Daylite" filters, the background above the lamps painted with a zinc oxide paint to absorb infrared radiation as much as possible, and a diffusing skylight of glass ground on one side, it was found that with a filter-and-lamp combination approximating 6800° K. in color temperature, the cotton classers could work under it after becoming accustomed to it, but it was too yellowish to be a good substitute for slightly overcast north sky. Changing the Daylite filter from Macbeth 2ACL9, 5.5 mm. thick, to Macbeth BDK11 of the same thickness, and using lamps operating at 3000°, gave a color temperature of about 7400° and illumination "sufficiently like that from the overcast north sky which they [the Cotton Appeal Board] prefer to make the cotton look natural to them."

This result was obtained with lamps rated at 1,000-hr. life, 1,000-w. lamps in the outer rows, and 500-w. lamps in the center.

AGRICULTURAL ECONOMICS

[Proceedings of the twenty-ninth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 21 (1939), No. 1, pp. 414, figs. 23*).—Included are the following papers, with discussions, presented at the meeting held at Detroit, Mich., December 28–30, 1938 (E. S. R., 80, p. 432): Contributions of Agricultural Economics to Farming, by C. E. Ladd (pp. 1–7) (Cornell Univ.); Contribution of Agricultural Economics to the General Welfare, by H. R. Tolley (pp. 8–21) (U. S. D. A.); Effects of the AAA Program Upon Regional Specialization in Agriculture, by H. B. Rowe (pp. 31–43); Effect of the AAA on Farm Organization and Operation, by P. E. Johnston (pp. 46–54) (Univ. Ill.); Public Control of Land Use in Europe, by K. Brandt (pp. 57–71); Public Control of Land Use in the United States, by G. S. Wehrwein (pp. 74–85) (Univ. Wis.); How Fast Should Cooperatives Grow? by H. E. Babcock (pp. 89–95); Adapting Farm Management Research to New Opportunities, by S. E. Johnson (pp. 98–106) (U. S. D. A.); Soil Productivity Related to Farm Organization and Income, by G. W. Miller (pp. 107–113) (Ohio State Univ.); Type of Farming Modifications Needed in the Great Plains, by E. A. Starch (pp. 114–120) (Mont. State Col.); Federal Purchase and Administration of Submarginal Land in the Great Plains, by L. C. Gray (pp. 123–131), and Measuring Changes in the Demand for Farm Products, by F. L. Thomsen (pp. 132–142) (both U. S. D. A.); Consumers' Incomes and Demand for Certain Perishable Farm Products, by M. P. Rasmussen (pp. 145–154), and Long-Time Price Changes and Farm Operation, by S. W. Warren (pp. 156–164) (both Cornell Univ.); Technological Developments Affecting Farm Organization, by J. A. Hopkins, Jr. (pp. 165–177) (Iowa State Col.); Public Assistance to Low-Income Farmers in the North, by R. C. Smith (pp. 178–187), and Public Assistance to Low-Income Farmers of the South, by T. R. Reid (pp. 188–194) (both U. S. D. A.); Types of Livestock Markets and the Price Structure, by R. C. Ashby (pp. 195–214) (Univ. Ill.); Livestock Marketing Methods and Livestock Prices, by P. Richards (pp. 219–227) (U. S. D. A.); Legal Responsibilities of Farm Managers and Clients, by T. D. Morse (pp. 228–234; Economic Research Needed by Professional Farm Managers, by E. Walley

(pp. 235–237); Base Periods for Farm Price Studies, by *O. C. Stine* (pp. 238–242) (U. S. D. A.); The Case for the 1910–14 Base, by F. A. Pearson and K. R. Bennett (pp. 243–246) (Cornell Univ); A Base in the 1920–29 Period for Farm Price Studies, by *E. L. Butz* (pp. 247–252) (Purdue Univ.); The Base Period for Parity Prices, by L. H. Bean and P. H. Bollinger (pp. 253–257) (U. S. D. A.); Land Values and Government Agricultural Policy, by C. H. Hammar (pp. 258–261) (Univ. Mo.); Monetary Policy in Relation to Land Values, by L. H. Bean (pp. 262–264) (U. S. D. A.); Land Values and Farm Credit Policy, by A. B. Lewis (pp. 265–267); Land Values and Commercial Bank Policy, by A. G. Brown (pp. 268–272); Land Rents and Land Values in Italy, by C. L. Stewart (pp. 273–275) (Univ. Ill.); Tax Reverted Lands in the Lake States, by E. J. Ellingson (pp. 276–279), and Land Use Problems in Minnesota, by R. M. Gilcreast (pp. 280–286) (both U. S. D. A.); Land Use Problems in Michigan, by F. P. Strubsaker (pp. 287–290); Ways and Reducing Costs of Distributing Milk *in New York, by L. Spencer (pp. 291–298) (Cornell Univ.); Reducing Cost of* Distributing Milk in California, by J. M. Tinley (pp. 299–308) (Univ. Calif.); Reducing Cost of Distributing Milk in Maine, by G. F. Dow (pp. 309–314) (Univ. Maine); "Education in Farm Finance" in Farm Management Extension Work, by C. R. Arnold (pp. 315–320); Economic Information in Farm Management Extension, by V. R. Wertz (pp. 321–325) (Ohio State Univ.); Farm Records and Accounts in Farm Management Extension Work, by H. A. Berg (pp. 326–331) (Mich. State Col.); Farm Management Facts in Building Area and State Programs, by J. H. McLeod (pp. 332–336) (Univ. Tenn.); Graphic Method in Price Analysis, by E. J. Working (pp. 337–345) (Univ. Ill.); Graphic Methods Used in Presenting Agricultural Economics Information, by R. G. Hainsworth *(pp. 346–353) (U. S. D. A.); Developments Arising Out of Trial Census in 1938,* by Z. R. Pettet (pp. 354, 355); Development of Partial and Sample Census Methods, by C. F. Sarle (pp. 356–364), Results of Four Methods of Sampling Individual Farms, by I. Holmes (pp. 365–374), and The Complementary and Competitive Character of Agriculture in Latin America and the United States, by L. A. Wheeler (pp. 375–379) (all U. S. D. A.); British Empire Trade Agreements in Relation to Trade in Farm Products Between Canada and the United States, by J. E. Lattimer (pp. 380–386); and Servicing Federal Land Bank Loans Through National Farm Loan Associations, by M. S. Kennedy, Jr. (pp. 388–396).

The reports of the officers and committees are also included.

[Papers presented before the British Agricultural Economics Society] (*Jour. Proc. Agr. Econ. Soc., 5 (1938), Nos. 2, pp. 103–170, figs. 3; 3, pp. 173–*277).—These reports continue the series (E. S. R., 79, p. 120). No. 2 includes the following papers with discussions presented to the conference in London, December 7 and 8, 1937: The Practice of Price Stabilization, by A. N. Duckham (pp. 107–120); Some Aspects of Price Fixing Policies, by W. H. Jones (pp. 121–136); Experiences With Cost Accounts in Northern Ireland, by R. W. Hale (pp. 137–155); and The Recent Depression in Scottish Agriculture, by W. H. Senior (pp. 158–170); and No. 3 includes the following papers with discussions presented at the conference at Oxford, July 1–4, 1938: The Relation of Agricultural Education and Research to the Development of British Agriculture, by Earl de la Warr (presidential address) (pp. 190–211); The National Trust as Landlords, by D. M. Matheson (pp. 212–223); Agricultural Marketing With Special Reference to Potatoes, by W. Gavin (pp. 224–240); Agriculture and National Defense, by A. W. Ashby (pp. 241–258); and Manorial Traffic and Agricultural Trade in Medieval England, by R. Lennard (pp. 259–277).

Studies of economic conditions (*Nebraska Sta. Cir. 60 (1939), pp. 75–78*).—The station work is briefly reviewed from its inception.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 197 (1939), pp. 34–36*).—Included is an article by H. R. Moore on Tax Delinquent Rural Land Unsuited for Agriculture in Southeastern Ohio, with table showing for 62 holdings of 40 acres or over in Hocking County and 276 holdings in Scioto County the land use, topography, and tax valuation per acre of land adapted, poorly adapted, and not adapted to agriculture. The table (E. S. R., 80, p. 835) by J. I. Falconer of index numbers of production, prices, and income, is brought down through December 1938.

Development of legislation in Ohio that relates to agriculture, H. R. Moore (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 112 (1938), pp. [1]+II+72*).—"The principal purpose in this publication is to trace only the development of legislation intended in some way to promote the interests of agriculture and the public welfare, through regulation and control under the police power of the State, through the authorization of various types of voluntary associations, and finally, through the creation of certain public institutions or publicly managed services administered by some department of the State or its subdivisions." The sections deal with legislation on the subjects of agricultural education, land use, cooperative associations, highways, taxation, landlord and tenant relationships, animals and fences, and regulatory legislation pertaining to agriculture.

Trends in public policy affecting agriculture as interpreted from legislative developments in Ohio, H. R. Moore (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 111 (1938), pp. [1]+18*).—A summarization of the preceding bulletin.

The maintenance of agricultural production during depression: The explanations reviewed, J. K. Galbraith and J. D. Black (*Jour. Polit. Econ., 46 (1938), No. 3, pp. 305–323*).—The following explanations that have been advanced are discussed: An atempt to offset falling prices by increased production, certain important differences in the competitive structure of industry and agriculture, certain physical or technological peculiarities of agricultural production which may inhibit response to price changes, the presence of greater or lesser degree of subsistence production in agriculture, and reduction in depressions of the prices of important cost factors.

The world agricultural situation in 1936–37 and 1937–38 (*Roma: Internatl. Inst. Agr., 1939, pp. IV+275+[1], figs. 25*).—The production and supply of the more important agricultural products, the general economic background of the agricultural situation, international economic relations, world trade in agricultural products, agricultural prices and incomes, and the agricultural policies in the different countries are described and discussed.

Foreign Agriculture, [April 1939] (*U. S. Dept. Agr., Foreign Agr. Serv., Foreign Agr., 3 (1939), No. 4, pp. 127–166, figs. 6*).—Included are articles on The Hog Industry in Sweden, by H. E. Reed (pp. 129–140); British Cotton Textile Industry and Demand for Raw Cotton, by A. W. Palmer (pp. 141–154); and The German-Rumanian Economic Agreement (pp. 155–160); and notes on recent developments in foreign agricultural policy as follows: Cooperative societies of Mexico exempt from tax payments, Yugoslav Government to construct nationwide warehouse system, Japan adopts 10-yr. plan for agriculture in Taiwan, Germany to start ever-normal granary, Egyptian Government contemplates aid to cotton growers, and Poland to establish a hemp-production industry.

[Changes in technology and labor requirements in crop production] (*Philadelphia: Works Prog. Admin. [U. S.], 1938, Rpts. A–4, pp. XIII+134, figs. 11; A–5, pp. XVIII+181, figs. 42; A–6, pp. XVI+255, figs. 34; A–7, pp.*

XVI+132, figs. 30; A–8, pp. XVI+163, figs. 34; A–9, pp. XV+114, figs. 37).—These reports continue the series (E. S. R., 79, pp. 694, 699).

A–4. *Potatoes*, H. E. Knowlton, R. B. Elwood, and E. G. McKibben.—This report discusses the importance of the potato crop, the changes in production practices and their effects on labor requirements, soil maintenance practices, and the development of improved varieties. Appendixes include tables showing acreage, yield, and production in the major production areas, the changes in production practices, potato-growing equipment, and labor used per acre, 1909–36; the number and acreage of farms surveyed in the study in 1936, and the distribution of such farms by amount of labor used; and abstract of data from secondary sources on labor requirements for potatoes.

A–5. *Corn*, L. K. Macy, L. E. Arnold, and E. G. McKibben.—The development in corn breeding, cultural methods, specialized corn equipment, and cultural practices and labor used in the corn, small grain, dairy, and cotton areas, and tractor adoption and labor requirements in corn production are discussed. Appendixes include tables showing the acreage, yield, and production of corn by areas, 1909–36; the estimated percentages of losses by diseases in the United States 1917–35; selected data on experimental studies in cultural practices; domestic sales of equipment 1899–1937; labor used 1909–19, 1929, and 1936 in producing corn by States; abstract of data from secondary sources on labor on corn; and notes on sizes of farms in the study.

A–6. *Trends in size and production of the aggregate farm enterprise, 1909–36*, R. G. Bressler, Jr., and J. A. Hopkins.—Two sets of index numbers are included. The first shows the changes in the size of the aggregate farm enterprise for the United States and each of the 11 major farming areas, and the second the changes of annual volume of physical production in each area. "Both of these indexes are weighted by the appropriate labor requirements per unit (acre, head of livestock, or unit volume of output) during the base period and thus represent measures of growth or decline commensurable with the indexes of the annual labor input into the agricultural industry, which will be presented in later reports. That is to say, the indexes of size of enterprise presented here could be described as measures of what agricultural employment would have been if the labor requirements per acre and per head of livestock had been throughout the entire period 1909–36 the same as during the base period of the indexes, 1924–29. Similarly, the indexes of production represent what employment would have been if the labor requirements per unit of product had not changed." No attempt has been made to develop explanations of the changes beyond pointing out a few of the more obvious ones. Tables, charts, and maps show for the United States and 11 areas the indexes of crop acreage, livestock numbers, and aggregate farm enterprise, 1909–36, and the production of principal crops and different kinds of livestock and livestock products.

Appendixes include tables showing the acreage, yield, and production, 1909–36, of different crops and different kinds of livestock, total and by areas, the enterprises included in the index of size of the aggregate farm enterprise, the weights used in computing the indexes of size of aggregate farm enterprise and production, and corrections in the indexes for crop abandonment, droughts, and A. A. A. programs.

A–7. *Cotton*, W. C. Holley and L. E. Arnold.—This report is limited to the trends in the amount of labor used in producing the cotton crop, and the effects of technological changes on these trends. The trends in acreage, yield, and production and in tenure groups of producers, the recent changes in operations and amounts of labor used, mechanization in cotton production, influence of improved

varieties of cotton, the development in cultural practices, and cotton diseases and insects are discussed. Appendixes include tables showing the acreage, yield, and production, 1909–36, by major cotton areas; percentages of farms reporting recognized varieties of cotton 1909–36; average staple length and percentages of cotton tenderable 1928–36; tons of fertilizer consumed 1909–35; average yearly amounts of labor used by States 1907–11, 1917–21, 1927–31, and 1933–36; and abstracts of data from secondary sources on labor on cotton.

A-8. *Trends in employment in agriculture 1909–36*, E. E. Shaw and J. A. Hopkins.—Included are tables, maps, and charts with discussion showing by years 1909–36 the average number of unpaid family workers and hired labor, and seasonal variations in each of the 12 agricultural districts into which the United States was divided. Appendixes describe the method used in estimating agricultural employment, the data used on number of farms, the Crop Reporting Board (U. S. D. A.) data on farm employment, the U. S. Census data on gainfully occupied persons in agriculture, index of man requirements for crops and livestock in California 1909–36 (E. S. R., 72, p. 401), part-time employment, indexes of size of enterprise handled and production per worker, 1909–36, and the monthly agricultural employment 1925–36.

A-9. *Tractors, trucks, and automobiles*, E. G. McKibben and R. A. Griffin.—This report describes the development and improvement of the tractor, farm production of tractor fuels, the adoption of farm tractors, trucks, and automobiles and effects on the size of farms, labor requirements, horse requirements, location of enterprises, etc. Appendixes show the chronological development of the tractor, statistics as to tractor sales, tractors on farms, displacement of farm animals and man labor, feeder requirements for work animals, etc.

Labor requirements for crop production in Ohio, R. H. Baker *(Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 115 (1938), pp. IV+[1]+28, fig. 1)*.—Charts or tables are included by which the man, horse, and tractor hours required to produce 1 acre of the principal crops in the western, northeastern, and southeastern parts of the State with various combinations of methods of growing and harvesting can be determined. The charts are of a form similar to those on highway maps to show distances between points.

Land utilization in California: A list of references, compiled by A. Poli and P. J. Webster *(U. S. Dept. Agr., Bur. Agr. Econ., 1938, pp. [1]+39)*.—This is a mimeographed list of the more important studies in California and other States bordering on the Pacific Ocean.

Better land utilization for Ohio, J. H. Sitterley and J. I. Falconer *(Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 108 (1938), pp. [1]+VIII+107, figs. 66)*.—Part 1 (pp. 1–78) includes data on climate, topography, markets, present utilization of land, trend in the number, size, acreage, and crop acreages, type-of-farming areas, value of farm products, farm real estate values 1935, tenancy, tax delinquency, State contribution to schools, and open country population on relief November 1, 1934, and includes articles on Soils of Ohio, by G. W. Conrey (pp. 7–12); Primary Vegetation Areas in Ohio, by E. N. Transeau and H. C. Sampson (p. 19); and Population of Ohio, by G. H. Smith (pp. 21–32). Part 2 (pp. 79–83) discusses the objectives of a land use program. Part 3 (pp. 84–107) discusses desirable changes in land use in different areas, and describes the land use activities in the State.

Land use problems in central South Dakota, 1937 *(Brookings: S. Dak. State Planning Bd., 1939, pp. 27, [pls. 6], figs. [4])*.—Tables and maps are included showing the size of operating units, crop distribution, grass-crop ratios, livestock distribution, leasing arrangements, etc., in 27 counties.

An economic study of land utilization in southern Alberta, G. H. Craig and J. Coke *(Canada Dept. Agr. Pub. 610 (1938), pp. 79, figs. 16)*.—Detailed

farm records were obtained by enumerators in the summer of 1935 from 493 farms in the area. The region and its people, land acquisition, farm abandonment, types of machinery used, amount of paid and unpaid labor, cash expenditures, etc., are discussed. Analysis is made of the relationship between size of farm, soil, and tenure, and the utilization of land, value of farm property, numbers of livestock, net returns, distribution and change in indebtedness of operators, and changes in net worth.

Physical and economic factors related to land use classification in southwest central Saskatchewan (*Canada Dept. Agr. Pub. 609 (1938), pp. 52, pl. 1, figs. 3*).—This is a preliminary report presenting economic information relating to the soil types in seven rural municipalities surveyed in 1935. The physical and climatological conditions, wheat yields, population, land tenure, land use, numbers of livestock, farm buildings, acquisition of land, vacant and abandoned farms, farm indebtedness, etc., are discussed.

Extending public control and management of forest land without purchase, C. H. HAMMAR. (Mo. Expt. Sta.). (*Jour. Forestry, 37 (1939), No. 1, pp. 8–13*).—A proposed plan for combining public control and private ownership is outlined and discussed. The plan provides for continued private ownership under easement with control contracts granted to the Federal or State Governments.

Farm organization by soil type on the Eastern Highland Rim, C. E. ALLRED and A. C. ROBISON (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 90 (1939), pp. [1]+III+34, figs. 10*).—This is a complementary study to that previously noted (E. S. R., 81, p. 126).

Factors determining types of farming, C. E. ALLRED and B. T. LANHAM, JR. (Coop. U. S. D. A. et al.). (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 79 (1938), pp. [1]+II+37, fig. 1*).—This is a general discussion of the physical, economic, social, and biological factors determining types of farming.

Major economic trends in the dry edible bean industry, R. K. POND (*U. S. Dept. Agr., Agr. Adjust. Admin., Market Inform. Ser., 1938, GCM–6, pp. III+23, figs. 12*).—Charts and tables are included and discussed showing usually by years 1922–37 the production, prices, movements, foreign trade, freight rates, etc., for dry edible beans.

Costs and returns in apple production, Rouville County, Quebec, A. GOSSELIN (*Canada Dept. Agr. Pub. 624 (1938), pp. 15*).—Analysis is made of the financial returns for the crop years 1929–34, inclusive, and the cost of producing and marketing for the years 1932–34, inclusive. The data were obtained by farm surveys each year.

Financial results in fattening cattle, M. H. SAUNDERSON and A. ROTH, JR. (Mont. Expt. Sta.). (*Amer. Cattle Prod., 20 (1938), No. 7, pp. 1–3*).—Tables are included showing the necessary selling prices per 100 lb. for calves, yearling and 2-year-old steers, and cows, with prices of feed and livestock at different levels. The tables show the costs for animals, feed cost, labor, equipment, death loss, and interest rates.

Profitable dairy management, K. T. WRIGHT and A. C. BALTZER (*Michigan Sta. Spec. Bul. 297 (1939), pp. 57, figs. 23*).—Complete cost records were obtained from 64 to 148 (total 499) dairy herds throughout the State for the years 1932–36, inclusive. The costs and returns per cow and unit of production, and the factors affecting such costs and returns are analyzed.

The farms averaged 159 acres, with 80 percent of the land in feed crops, 13 cows and accompanying young stock, 9 ewes, 118 hens, and slightly less than 1 sow. The average feed consumption per cow per year was approximately 1 ton of concentrates, 1.5 tons of hay, 2.7 tons of silage and roughage, and 166,

days pasture. The average labor requirement per cow per year was 154 hr., and the average cost $140, of which $57 was for feed, $29 for labor, $14 for management, $9 for use of buildings and equipment, and $31 for other items. The average income from herds producing an average of 339 lb. of butterfat per cow was approximately $134. The farm cost per 100 lb. of milk was $1.79. The annual costs and net returns per cow and the labor and management returns per hour increased from approximately $107, $87, and 11 ct., respectively, for the herds producing under 250 lb. of butterfat per cow, to approximately $163, $165, and 31 ct., respectively, for the herds with 400 lb. or over of butterfat per cow. The cost per pound of butterfat was 50 ct. and 38 ct., respectively. Feed cost per pound of butterfat was 60 percent higher in the high-feed-cost herds and 23 percent higher in medium-cost herds than in the low-cost herds. The most efficient dairyman averaged 32 hr. labor per 100 lb. of butterfat and the least efficient 64 hr. A total of 189 hr. of labor per cow was spent on herds averaging 6 cows as compared with 137 hr. on those averaging 26 cows.

Cost of milking averaged 29 ct. per 100 lb. of milk with hand-milking and 30 ct. with machines in herds of less than 10 cows, and 28 ct. and 22 ct., respectively, in herds of over 10 cows. The net returns per cow per year averaged 20 ct. where milk was sold as market milk, −$16.04 where sold as condensery milk, and −$20.16 where cream was sold to creameries. Labor and management returns per hour were 28 ct. in the eastern, 29 ct. in the southwestern, and 20 ct. in the central and northern sections of the State. The average total costs per pound of butterfat and per hundredweight of milk were Holsteins 42 ct. and $1.50, Guernseys 41 ct. and $1.95, and Jerseys 40 ct. and $2.07. The average net returns per cow per year and total costs per pound of butterfat were −$4.53 and 40 ct. in herds with less than 25 percent purebred cows, −$1.11 and 40 ct. where 25 to 74 percent of the cows were purebred, and −$11.80 and 43 ct. where over 75 percent were purebred. The total cost per pound of butterfat was 32 ct. in the low-cost one-fifth of the herds and 53 ct. in the high-cost one-fifth. The net return varied from −$1.53 in February to +$1.39 in June, and the return per hour for labor and management from 17 or 18 ct. in October to February, inclusive, to 41 ct. in June.

Public regulation of milk marketing in California, J. M. Tinley (*Berkeley: Univ. Calif. Press, 1938, pp. XI+213*).—The economic background of the present milk control legislation of California is described, the salient features of present legislation are discussed, and analysis is made of the procedures and methods adopted to determine the basis for resale prices of fluid milk.

Milk industry of the State of New York with particular reference to the New York Metropolitan Area, J. J. Bennett, Jr. (*New York: Case Press, Inc., 1938, pp. [2]+129, [figs. 4]*).—This is a report of the Attorney General of New York to the Governor and Legislature. It discusses among other things the metropolitan market in fluid milk as a field for monopoly, production, use, and distribution of milk, method of sale, the bargaining cooperatives, the Rogers-Allen Law of 1937, and the bargaining agencies under this law, the cost of handling, pasteurizing, and distributing milk, prices, profits, etc.

Relative prices to producers under selected types of milk pools, T. G. Stitts, W. C. Welden, E. W. Gaumnitz, O. M. Reed, and H. L. Forest (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 25 (1938), pp. IV+127, figs. 9*).—This study, made in 1937 in cooperation with the U. S. D. A. Agricultural Adjustment Administration, has for its objectives "to present a general treatment of the questions involved in pooling milk-sales returns; to describe milk-marketing conditions in Boston with special reference to variations in the milk supply which have been or may be of significance in pooling operations; to measure some of the effects of such variations on the annual prices received by various groups of

producers, when a selected number of the more common methods of pooling are used to distribute sales returns; and to indicate in a broad way the possible nature of further studies of this subject." The analytical parts deal entirely with the conditions in the milkshed and marketing area of Boston, Mass. The first section is mainly a description of the supply area for the Boston milk market, and the second a description of the development of milk pools and a discussion of the history of cooperative associations of producers, class prices of milk, and pools of sales returns in the Boston market. The third section is a rather broad and technical treatment of the factors involved in pooling sales returns, and the fourth a statistical analysis of the effect of different methods of pooling on the pattern of prices to producers. The statistical analyses are based chiefly on information collected in the administration of Federal programs regulating the handling of milk in the Boston market. Appendixes include a description of the method used in calculating the milk-pool prices and the basic statistical data used in the study.

The surplus problem in the northeastern milksheds, L. Spencer. (Coop. Cornell Univ.). (*Farm Credit Admin.* [*U. S.*], *Coop. Div., Bul. 24* (*1938*), *pp. IV+88, figs. 21*).—This study covers the New England States, New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia. Special attention is given the New York milkshed, but the Pittsburgh, Pa., market is not included. The data were obtained from the Federal and State departments of agriculture, the principal cooperatives, milk dealers, and cream buyers in each market. Part 1 on the utilization of milk discusses the demand and supply situation, production and disposal of milk by farmers, utilization of milk, and sharing the surplus milk in the New York milkshed. Part 2 on western cream deals with the development of the trade, sources, quality requirements, shipments, etc., and the operations, methods of selling, costs of making and shipping cream, net returns, etc., of western cream plants.

Problems in the basic-surplus plan in the Philadelphia milk shed, J. Andes (*Diss. Univ. Pa., Philadelphia, 1937, pp. 166,* [*figs. 2*]).—This dissertation discusses the factors determining the prices of milk, milk price plans, the development and operation of the Philadelphia plan, and minority objections to this plan.

An economic study of the consumption of milk and cream in certain urban and rural districts of Canada, W. C. Hopper and G. P. Boucher (*Canada Dept. Agr. Pub. 608* (*1938*), *pp. 42, figs. 14*).—Surveys were made in the cities of Oshawa, Ont., Quebec, and Calgary, Alta., a village in each province, and five farm areas, including three cheese-producing and two non-cheese-producing areas in the provinces of Ontario and Quebec. Analysis is made of the consumption of fluid milk, cream, and manufactured milk, and the relations of locality, income, size of family, and nationality to consumption.

Post-war developments in the marketing of butter, W. H. Nicholls (*Iowa Sta. Res. Bul. 250* (*1939*), *pp. 321–384, figs. 3*).—This bulletin deals chiefly with the increased importance of large business units in the marketing of butter, special attention being given to changes in channels of distribution, concentration in the butter industry, and supplementary and complementary relationships involved in the recent increased diversification of dairy products distributed.

Butter marketing 1918–20, the developments 1921–27, the merger and diversification 1928–30, and the changes during the depression 1931–37 are described and discussed, and an economic appraisal made. The most important marketing channels 1918–20 were wholesaler-jobber, and a manufacturer-direct-to-retailer movement. For the first time the volume of farm-made butter for the country as a whole fell below that of creamery butter. To an important extent

butter reached the consumer unpackaged, and Federal grading existed only in the central markets. The period 1921–27 was marked by an increased emphasis on high quality butter, the rapid increase in various types of large scale direct-distributing agencies, and a reduction in the number of wholesalers. The most important development 1928–30 was the rise of large dairy corporations and their marked trend toward production diversification and territorial expansion. The period 1931–37, in spite of the continued increase in direct marketing, was a period of retrenchment and consolidation of past gains, and the author states "finally, in recent years the accuracy of the present butter-pricing mechanism has been questioned more than ever before. The development of direct buying and direct selling have so reduced the volume of wholesale trading that—combined with the very old problem of an almost universal 'premium' over the quotation—a drastic change in the basis of quotations or price-reporting policy will probably have to result if the volume of wholesale trading on the central markets continues to fall."

The livestock auction in Ohio, with a supplement on livestock dealer registrations, G. F. HENNING and E. B. POLING (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 110 (1938), pp. [2]+19, figs. 1*).—Using data on questionnaires returned by 207 farmers during each of the years 1934, 1935, and 1938, inclusive, the use made of livestock auctions, percentage of livestock sold and purchased through such auctions, the prices received, the advantages and disadvantages of auctions, and the satisfaction or dissatisfaction of the farmers with them are discussed.

The changing relative importance of the central livestock market, E. A. DUDDY and D. A. REVZAN (*Jour. Business Univ. Chicago, Studies Business Admin., 8 (1938), No. 4, pp. VII+122+[43], figs. 13*).—The organization and functions, the forces contributing to the origin and growth, the changes in the importance of central livestock markets, the reasons for the growth of decentralized marketing, and the relation of the price spread to changes in marketing method are described and discussed.

Marketing practices in producers' local cotton markets, J. W. WRIGHT (*U. S. Dept. Agr., Bur. Agr. Econ., 1938, pp. [2]+92, figs. 2*).—This preliminary report, based on data collected by the survey method in 101 markets throughout the Cotton Belt at the end of the 1935–36 marketing season, describes the problems of marketing cotton, the marketing practices of growers and first buyers, and makes an appraisal of the possibility of solving the present problems by adjustments in marketing procedures.

Trading in commodity futures (*U. S. Dept. Agr., Commod. Exch. Admin., [1939], CEA–14, pp. [5]+40, figs. 13*).—Tables, charts, and maps are included and discussed showing the agricultural commodities having futures markets, the location of such markets, average volume of futures trading in each commodity, open contracts in various wheat futures on the Chicago Board of Trade semimonthly for the year beginning July 1, 1936, number of offices of registered futures commission concerns by States February 1, 1938, occupations of futures traders in corn and wheat on the Chicago Board of Trade September 29, 1934, and the percentages of the futures wheat contracts on long and short contracts held by speculators and hedgers, character of open wheat contracts June 14–July 31, 1933, on the Chicago Board of Trade, relation between futures trading and annual production of wheat and cotton and total bank deposits, cash or spot prices and futures prices, volume of futures contracts on the Chicago Board of Trade settled by delivery, etc. The principal marketing functions of the organized commodity exchanges and the Commodity Exchange Commission are described.

Supplement [Nos. 3 and 4] to digest of decisions of the Secretary of Agriculture under the Perishable Agricultural Commodities Act, W. L. EVANS (*U. S. Dept. Agr., Bur. Agr. Econ., 1938, pp. [1]+39; 1939, pp. [1]+93*).—No. 3 supplements the digest (E. S. R., 78, p. 557) as revised by Supplement No. 2 (E. S. R., 79, p. 123). No. 4 supersedes No. 3 and includes all decision numbers and statements of rulings under the act since February 1, 1938.

Terminal fruit auctions as marketing agencies for farmers' cooperatives, K. B. GARDNER (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 29 (1938), pp. VII+90, figs. 9*).—This study was made to develop information for the assistance of members and managements of cooperatives in appraising the auction as a marketing agency. It is limited to some of the more important problems that could be dealt with from a statistical standpoint, dealing especially with the relationship between auction and private sale prices, the extent to which sales through terminal auctions meet the requirements of the trade in certain markets, the operations of representative auction companies as to classes of purchasers, relative importance of each class, number of commodities purchased by individual buyers, frequency of purchases, auction company ownership, relative importance of receivers, attitude of the buying trade to the auction method of sale, etc., and the factors bearing on whether large-scale purchasers can be adequately served by present auction sale methods. Most of the data were secured in the offices of 12 terminal auction companies in Baltimore, Boston, Chicago, Cincinnati, Cleveland, Detroit, New York, Philadelphia, Pittsburgh, and St. Louis, with some data as to volume of business from companies operating in Minneapolis, St. Paul, and New Orleans. The data are analyzed and discussed in sections on auction functions and services, price considerations, operating aspects, attitude of the buying trade, and large-scale purchasing at auction and at private sale.

Income parity for agriculture.—I, Farm income. III, Prices paid by farmers for commodities and services (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Adjust. Admin., and Bur. Home Econ., 1938, pt. 1, sects. 1, pp. [2]+II+59, [fig. 1]; 2, pp. [2]+II+41, [figs. 3]; 3, pp. [2]+II+10+[19], figs. 3; pt. 3, sects. 1, pp. [2]+II+27+[2], fig. 1; 2, pp. [2]+II+31+2; 3, pp. [2]+13+[2]; 1939, pt. 1, sects. 5, pp. [2]+II+92, figs. 2; 6, pp. [2]+II+61, figs. 6*).—These are the first of a series of preliminary reports presenting the findings as to farm income, expenses of agricultural production, prices paid by farmers for commodities and services, and income to farmers from nonfarm sources.

Part 1 includes the following sections: (1) Income from cotton and cottonseed, calendar years 1910–37, consisting of tables and charts showing for the United States and by States the sales, average price, and cash income from cotton lint and cottonseed, and the quantity and value of cotton and cottonseed in the possession of farmers January 1. (2) Income from tobacco, calendar years 1909–37, includes similar data for tobacco. (3) Income from hogs, calendar years 1909–37, shows for the United States cash and gross farm income, 1909–37; sales, prices, and income, relation of farm income from hogs and income of industrial workers, 1920–37, and for the United States and States the cash and gross incomes from hogs, pork, and lard; value of hogs slaughtered at home, number and value of hogs on farms, and the cost of hogs shipped in for feeding and breeding. (5) Income from wheat, calendar years 1910–37, shows for the United States the value of sales and home-consumed wheat; sales, prices, and cash income; and for the United States and by States sales, average price per bushel, cash income, and quantity and value of wheat in possession of farmers January 1. (6) Income from sheep and lambs, wool, and mohair, calendar years 1909–38, shows for the United States, 1909–38,

the value of sheep and lambs sold and consumed at home; sales, prices, and income; relation of incomes from sheep and lambs and that of industrial workers, 1920–38; sales, prices, and income from wool and mohair, and for the United States and by States the cash income from sheep, lambs, and wool; value of sheep and lambs slaughtered; cost of sheep shipped in for breeding and feeding; number and value of sheep on farms; sales, farm prices, and cash income for wool; and income from mohair.

Part 3 includes the following sections: (1) Medical service rates to farmers, 1910–14, 1924–29, 1932, and 1935–36, consisting of charts and tables showing data by regions of the United States as to hospitals, changes in doctors' fees 1910–14, 1924–29, 1932, and 1935–36, average expenditures per farm for medical services of different kinds 1935–36, and average physicians', dentists', oculists', optometrists', hospitals', and nurses' fees and charges to farmers. (2) Rates for electricity for farm home and farm power, 1910–14, 1920, 1924–36, shows by regions of the United States the index numbers of weighted average monthly bills for electricity for residences and for power, number of farms served by central electric stations for residences and power, and for selected States in each region the monthly bills for specified quantities of electricity. (3) Telephone rates to farmers in the United States, 1910–14, 1924–29, 1932, and 1935–36, consisting of tables and charts showing by regions of the United States the index of monthly charges to farmers for telephone service, the number of telephones on farms (by States), percentages of rural and urban homes with telephones, number of telephones by States on farms by types of companies 1930, etc.

Factors affecting farm prices, C. E. Allred and P. T. Sant (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 80 (1938), pp. I+IV+36, figs. 11*).—The factors affecting prices in general and those affecting specific groups of agricultural commodities—cotton, grain, dairy products, hogs, poultry and eggs, beef cattle, sheep and lambs, and wool—as they relate to Tennessee conditions are discussed.

Price spreads between the farmer and the consumer, R. O. Been, Jr., and F. V. Waugh (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. [2]+73, figs. 5; 1939, pp. [1]+31*).—The first report covers the period 1913–35. Tables show by years by product or groups of products for 58 food products used by workmen's families the retail value, equivalent farm value, actual margin, and farm value as percentage of retail value. Other tables and charts present data as to workmen's expenditures for food, the annual consumption of each of the 58 foods, the relation of retail and farm value of the food consumed by a typical workman's family, relation of margins of the 58 foods consumed and hourly earnings of wage earners, and the relation of margins to supply for selected foods. The methods of calculating the farm and retail values and spreads are discussed.

The second report brings the data down to December 1938.

Relation of cotton production to consumption by areas, Tennessee, C. E. Allred, B. D. Raskopf, P. B. Boyer, and G. H. Hatfield. (Coop. U. S. D. A.). (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 58 (1937), pp. [1]+III+27, figs. 6*).—Grade and staple length of cotton produced and consumed in different sections of the State and practices of mills in making purchases are described. The State consumes only 36 percent of the cotton it produces, and about 60 percent of its consumption is purchased out of the State.

Consumption of citrus fruits and related products in Baltimore and St. Louis, G. W. Hervey (*U. S. Dept. Agr., Agr. Adjust. Admin., Consum. Counsel Ser., Pub. 6 (1938), pp. IV+69, figs. 7*).—Using a schedule having 20 items, some with detailed subitems, data were obtained in the spring of 1936

for approximately 1,000 households each in Baltimore and St. Louis on consumer attitudes, preferences, purchasing habits, and other factors determining the use of fresh oranges and grapefruit, canned grapefruit, canned tomato, grapefruit, pineapple, prune, and orange juices, and dairy orange beverage. The frequency of use, quantities consumed, manner of use, relation of income to consumption, preference for brands, source of purchases, including relation of nationality, income, and price to source, etc., are discussed.

The frozen food industry: Selected references January 1937 to March 1939, compiled by H. E. Hennefrund (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 2 (1939), pp. 14*).—This is a mimeographed list.

Report on systems of agricultural credit and insurance, L. Tardy (*Genève (Geneva): League of Nations, Econ. and Financ., 1938, pp. VIII+116*).—This is a report to the League of Nations on an inquiry made with special reference to the countries of central and eastern Europe. It summarizes general conclusions based on the inquiry and the author's experience with agricultural credit practices in France and other countries on the value of credit in agriculture, development of agricultural mutual aid and cooperative organizations, need for credit suited to special conditions of agricultural production, methods of providing farmers with credit, rèsources utilized by agricultural credit institutions for making loans, security required for the repayment of loans, insurance against agricultural risks, farmers' indebtedness and the remedies adopted, and the organization of agricultural credit on an international basis. Recommendations are made regarding agricultural credit and agricultural insurance systems. An appendix includes a brief survey of the various countries of the world grouped on the basis of whether the organization for agricultural credit is largely centralized with direct State intervention, mixed with coexistent State organs and cooperative institutions, or consists of cooperatives receiving State encouragement and independent organizations, mostly cooperatives, not receiving State encouragement.

Agricultural long-term credit facilities in Great Britain, D. Witney (*Jour. Roy. Agr. Soc. England, 99 (1938), pp. 1-14*).—The progress and achievements under the Agricultural Credits Act of 1928, applicable to England and Wales, and the Agricultural Credits (Scotland) Act of 1929 are discussed. The financial structure of the Agricultural Mortgage Corporation, Ltd., and Scottish Agricultural Securities Corporation, Ltd., the methods of making loans, and the utilization of long-term credit facilities are discussed and general conclusions drawn.

Financial study of the joint stock land banks: A chapter in farm mortgage banking, C. H. Schwartz, Jr. (*Takoma Park, Md.: Wash. Col. Press, 1938, pp. XIV+210, [figs.] 3*).—The organization, development, and liquidation of the banks are discussed in chapters on economic and legislative background, organization of the banks, loaning activity, loan collection experience, foreclosures and real estate, financing the loaning operations, financial operations, land bank finance, receiverships, and liquidation. The author draws "certain conclusions from the experiences of these banks which may be valuable both from the point of view of banking history in the United States and that of the future of mortgage banking in general." Appendixes include a comparative synopsis of provisions of the Federal Farm Loan Act of July 17, 1916, respecting Federal and joint stock land banks, and tables showing by years 1917-37 the number of banks chartered, merged, liquidated, placed in receivership and in operation at the end of the year, and the name, date chartered, charter territory, and status of charter of the banks.

Semi-annual index of the farm real estate values in Ohio January 1 to June 30, 1938, H. R. Moore (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 113 (1938), pp. 5+[1], fig. 1*).—This bulletin continues the series (E. S. R., 80, p. 259).

Report and recommendations of the Farm Tenancy Committee (*Des Moines: Iowa State Planning Bd., 1938, pp. 63, figs. 4*).—This committee of 45 members, appointed by the Governor of Iowa, consisted of farm-owner operators, tenants, landlords, "institutional" farm owners such as insurance companies, legislators, and representatives of farm organizations, farm journals, and newspapers. Hearings in each county of the State and one State-wide hearing were held. Data were accumulated in the form of hearing reports, briefs, letters, and nearly 4,000 filled-out questionnaires. The present tenancy problem and Federal and State policies are discussed, and specific recommendations made as to measures to encourage farm-home ownership and to improve landlord-tenant relationships.

Farm leases being used in Tennessee, C. E. Allred, H. J. Bonser, and D. K. Law (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 91 (1939), pp. [1]+II+73, fig. 1*).—Included are lease forms in use in the State under varying conditions.

American cooperation, 1938 (*Washington, D. C.: Amer. Inst. Coop., 1938, pp. XIV+734, figs. [8]*).—This is a collection of 107 papers presented at the fourteenth summer session of the American Institute of Cooperation held at Pullman, Wash., and Moscow, Idaho, July 11–15, 1938. The papers deal with the economic and social foundations of cooperation, the developments in current problems in cooperation, Government programs and the cooperative pattern, the financial structure of cooperation, cooperative marketing of poultry and eggs, fluid milk, manufactured dairy products, wheat, tree fruits, small fruits and vegetables, potatoes, livestock and wool, and nuts, and cooperative purchasing of farm supplies. "Subjects considered ranged from practical problems confronting the cooperating farmer and his associations to a presentation of the latest trends in economic and social thought as they affect agriculture in general and the development and well-being of farm cooperation in particular."

A statistical handbook of farmers' cooperatives (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 26 (1938), pp. XII+334, figs. 19*).—This handbook deals with farmers' cooperative marketing and purchasing associations, mutual irrigation companies, mutual fire insurance companies, and some other types of cooperation, including grazing associations, rural electrification associations, and soil conservation associations. Such organizations as breeders, cow testing, fairs, contact locals, "educational" (4–H clubs, Future Farmers of America, horticultural societies, etc.), "general farm organizations" (grange, farm bureaus, farmers' unions, etc.), and farmers' mutual telephone companies are not included. The data were collected in cooperation with 32 State agricultural colleges, the college of agriculture of the University of Puerto Rico, and the Colorado director of markets. The tables and charts show for marketing and purchasing associations by State and commodity types data as to number, date of organization, legal status, membership, volume of business, assets, liabilities, borrowed capital, patronage dividends, number of and business with members and nonmember patrons, basis of voting, farmer control, etc.; for mutual irrigation companies, location, legal status, members, patronage, assets, liabilities, indebtedness, etc.; and for mutual fire insurance companies, location, insurance in force, types of business, terms of policies, assessments, borrowings, etc.

Pages 1–19 summarizes the more important findings.

Co-ops in agriculture, F. M. Hyre (*Farm Credit Admin. [U. S.], Coop. Div., Cir. C–111 [1939], pp. 22, fig. 1*).—A popular bulletin giving information based on the preceding bulletin.

Cooperatives in South Dakota, L. M. Brown and R. J. Penn (*South Dakota Sta. Bul. 328 (1939), pp. 31, figs. 7*).—The data, most of which are for the fiscal year 1935–36, were obtained from 354 associations, including elevators, oil stations, creameries, stores, etc. The extent of cooperation in the State, the time and purpose, legal aspects, organization and structure, financing, and results of cooperative associations are discussed.

Cooperative fluid-milk associations in Iowa, P. E. Quintus and T. G. Stitts. (Coop. Iowa Expt. Sta.). (*Farm Credit Admin. [U. S.], Coop. Div., Cir. C–105 (1937), pp. III+72, figs. 7*).—Information was obtained in 1935 and 1936 by surveys of the cooperative fluid milk associations of the State, and from interviews with leaders in dairying. The special problems of milk marketing in the State, the early cooperative efforts, the present organization, and corporate and cooperative features of the associations are discussed. The operating practices, management and accounting, sales plans, methods of making payments to producers, membership policies, the transportation of milk and cream, etc., are discussed.

Patronage problems of Mid-West Producers' Creameries, Inc., G. C. Laughlin and T. G. Stitts (*Farm Credit Admin. [U. S.], Coop. Div. Cir. C–106 (1938), pp. IV+59, figs. 9*).—The Mid-West Producers' Creameries, Inc., established in 1932, is primarily a service organization for 20 member creameries in Michigan, Indiana, Tennessee, and Illinois. The organization, financial structure and condition, and the services rendered the member associations by the Mid-West Producers' Creameries, Inc.; membership policies, financing, procurement methods, and costs of the member associations; the factors affecting sales returns; operating efficiency; prices paid for butterfat; creamery operating margins; and price systems are discussed.

Financial operations of Ohio farmer owned elevators during the fiscal year 1937–38, B. A. Wallace (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 116 (1938), pp. [1]+20*).—This bulletin continues the series (E. S. R., 78, p. 870).

Cooperative purchasing through the Illinois Farm Supply Company and its member county companies, J. H. Lister (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 27 (1938), pp. VI+173, figs. 31*).—The membership of the Illinois Farm Supply Company, one of the 13 units of the Illinois Agricultural Association, in 1936 consisted of 62 county service companies (farmer-owned cooperative oil associations), 3 cooperative marketing associations, and a State-wide grain marketing association. Part 1 discusses the growth and control of the Illinois Farm Supply Company, its services to member companies, and its operating and financial status. Part 2 discusses the growth and control, the method of operation, the operating efficiency, and financial condition of the county companies and their relation to the Illinois Farm Supply Company. Suggestions are made for improving the system and its operation. The data which cover the operating years 1926–36 were obtained by interviews with the officials of the companies, questionnaires, annual reports, audits, and other operating reports, etc. Appendixes include articles on incorporation, bylaws, and membership agreements of different classes of members, a standard form of articles of incorporation for county service companies, accounting forms, and tables of basic statistical data used in the study.

Farmers' purchasing associations in Wisconsin, R. K. Froker and J. G. Knapp. (Coop. Wis. Expt. Sta.). (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 20 (1937), pp. IV+118, figs. 9*).—Data were gathered in 1935 by visits to

practically all the local and wholesale farmers' purchasing associations in the State. The development, legal basis, types, location, and operating records of cooperative purchasing associations in the State are described. The general organization, operating methods, financial and operating condition, and the comparative standards for measuring operating efficiency of different types of local cooperative associations, and the structure, methods, and operations of large-scale purchasing associations are analyzed and discussed.

Farmers' mutual windstorm-insurance companies, G. A. BUBOLZ (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 21 (1938), pp. IV+39, figs. 4*).—The development, costs of insurance, accomplishments, etc., of farmers' mutual windstorm-insurance companies are described and discussed. An analysis is made of the articles of incorporation, bylaws, contracts, etc., of over 50 companies. The data were obtained through questionnaires, letters, and interviews, and from the reports of State insurance departments.

Forest fire insurance in the northeastern States, H. B. SHEPARD (*U. S. Dept. Agr., Tech. Bul. 651 (1939), pp. [2]+II+46, figs. 6*).—This bulletin follows the same lines as that for the Pacific Coast States (E. S. R., 77, p. 52). The contributive and causative forest fire hazards, and the construction of the rating schedules for different types of forest regions in the nuortheastern States are discussed. Recommended insurance forms for the area are included.

Crops and Markets, [April 1939] (*U. S. Dept. Agr., Crops and Markets, 16 (1939), No. 4, pp. 69–88, figs. 2*).—Included are crop and market reports of the usual types.

The estimated gross cash income from the sale of agricultural products from Ohio farms by counties—1936 and 1937, P. P. WALLRABENSTEIN and J. I. FALCONER (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 114 (1938), pp. [1]+19*).—This bulletin continues the series (E. S. R., 76, p. 260).

World production in meat, A. BRIZI (*Internatl. Inst. Agr. [Roma], Studies Princ. Agr. Prod. World Market, No. 3 (1938), pp. XI+319, pls. 8, figs. 15*).—This volume supplements that on International Trade in Meat (E. S. R., 78, p. 877). Part 1 (pp. 1–19) deals with the total number and distribution of livestock throughout the world, and the density of livestock per thousand population. Part 2 (pp. 21–223) covers the evolution of the bases of meat production, the development in livestock numbers, and the trend of slaughtering and production. Part 3 (pp. 225–295) deals with tendencies in the development of production and trends in the utilization of livestock. Statistical tables are included in the appendixes.

The first world agricultural census (*Internatl. Inst. Agr. [Roma], First World Agr. Census Buls. 26 (1936), pp. 22; 29 (1938), pp. 12; 30, pp. 22; 33, pp. 33; 35, pp. 157; 36, pp. 79; 37, pp. 139; 38, pp. 93; 40, pp. 47; 41, pp. 25*).—These bulletins continue the series previously noted (E. S. R., 79, p. 703). No. 26 presents data for Kenya, No. 29 for Northern Ireland, No. 30 for Japan, No. 33 for Italy, No. 35 for Czechoslovakia, No. 36 for France, No. 37 for Germany, No. 38 for Canada, No. 40 for Mexico, and No. 41 for Uruguay.

RURAL SOCIOLOGY

Rural psychology: A partial list of references, compiled by M. T. OLCOTT (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 78 (1939), pp. VI+76*).—Included are 183 references on the social psychology of rural life and on the psychology of farm management, or the scientific management of agricultural labor classified as general, attitudes and opinions (with subdivisions on Government and politics, marketing, and relief), family and community life, and farm

labor. References relating to farm youth are omitted. Those on farm labor relate only to scientific studies or "Taylorism" applied to the farm.

The radio and rural research, F. H. Forsyth. (Univ. Minn.). (*Rural Sociol., 4 (1939), No. 1, pp. 67–77*).—It is stated that radio, as an instrument of diffusion of urban culture and two-way leveling of rural and urban cultures, has and will have effects which are at least still uncalculated.

Soils, crops, and men: A study in harmony, M. L. Wilson. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 1, pp. 1–10*).—The success of scientific agriculture in bringing about highly efficient production of an abundance of material needs is contrasted with the small progress thus far made toward harmonizing this productive efficiency with the unchanged elements of our economic structure.

The good American earth, R. D. Bowden (*Rural Sociol., 4 (1939), No. 1, pp. 78–87*).—The author believes that any proposed remedies sufficient in scope and vitality to effect a realistic solution of the problems of American agriculture must be more drastic and fundamental than can be found in crop reduction formulas, farm debentures, or price-pegging operations. Human and social values are in the center of the picture and involve much more than economic appeasement of landlords.

Science and civilization, O. W. Israelsen. (Utah State Agr. Col.). (*Utah Acad. Sci., Arts, and Letters, Proc., 14 (1936–37), pp. 81–89*).—The author proposes to meet the challenge of perpetuating agriculture and civilization in arid regions by continuing and enlarging the applications of the sciences to agriculture. He calls attention to the often repeated statement that there has never been any long-continued successful irrigation agriculture in any climate anywhere in the world.

The social effects of recent trends in the mechanization of agriculture, C. H. Hamilton (*Rural Sociol., 4 (1939), No. 1, pp. 3–19*).—The high point in the manufacture and sale of farm tractors and other farm equipment in the United States was reached in 1937, when the value of such equipment sold by manufacturers for use in the United States amounted to $507,146,913. A recent survey of 3,000 farms shows that 40.3 percent of the tractors on farms and ranches in the United States were bought in the 3 yr. preceding 1938. Temporarily, mechanization increases the individual farmer's income; but ultimately, if mechanization actually lowers cash costs he is forced to cut his prices and at the same time pay higher costs for land and fixed costs for land, machinery, and motor fuel. The farmer also loses some of the advantages of mechanization through continually rising standards and costs of living. The author expresses the view that the mechanized farmer and machinery manufacturer have shifted a lot of their costs to the shoulders of the State, and that new governmental functions, such as the social security, farm security, agricultural adjustment, works program, and housing program are the fruit of poorly controlled merchanization in both industry and agriculture. Another social effect of mechanization and other technological changes is that a larger and larger percentage of agricultural products going into the market is being produced by a smaller and smaller percentage of the farm population.

Selected references on the history of agriculture in the United States, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 26 (1939), 2. ed., pp. V+43*).—This second edition (E. S. R., 74, p. 712) includes books and articles summarizing the main facts concerning agriculture in the United States or of some major period.

Agriculture and current population trends, C. Taeuber. (U. S. D. A.). (*Amer. Phil. Soc. Proc., 80 (1939), No. 4, pp. 477–489*).—Reproduction rates in the farm population indicate an excess of approximately two-thirds above re-

to U. S. Plain (formerly called Common), and were cooked as standing and as rolled roasts and by searing and constant-temperature methods. The data of the investigation proper are presented in sections dealing, respectively, with shrinkage and cooking times as influenced by style of cutting beef ribs, by method of roasting, and by grade.

On the basis of their respective weights when ready for the oven, standing roasts shrank less and cooked more rapidly than rolled roasts, but, on the basis of weights of the rolled roasts before boning, the rolled roasts shrank somewhat less than the standing roasts. From the fact that standing roasts were exposed to the oven heat for less total time than rolled roasts and that standing roasts are known to be juicier than rolled, it is suggested that the greater relative shrinkage of the standing roasts came from bone and connective tissue rather than from the edible portion.

The temperature of cooking had the greatest influence on shrinkage and cooking time. When roasts were cooked to the rare or medium stage, as determined by a meat thermometer, the lower the oven temperature the less was the rate of shrinkage and the slower the rate of cooking. At the well-done stage shrinkage was less definitely related to oven temperature. Even with very slow cooking at low temperatures it was not possible to cook meat well done and keep the shrinkage low. Comparisons with paired cuts of constant-temperature roasting with the searing method confirmed the findings of others that searing itself does not reduce shrinkage as was formerly considered the case. Shrinkage, however, was shown to be dependent not on searing alone but on the average oven temperature and on the cut used. A quick sear (265° C. for 20 min.) followed by slow cooking at 125° gave a higher average temperature than 125° during the entire time but lower than a constant temperature of 175°, which was also tested. In the first instance, shrinkage for the searing and nonsearing methods in three-rib roasts were 14.7 and 10.6 percent, respectively, and in the second, 14.2 and 21.1 percent, respectively. Two-rib roasts seared and then cooked at 175° throughout the entire period showed about the same shrinkage—14.1 and 14.7 percent, respectively.

In roasts classified by grade, the data on shrinkage showed that the higher the grade the smaller the evaporation loss and the larger the drippings loss, whatever the style of cutting or method of cooking. This is attributed chiefly to the higher average fat content of high-grade beef. Considerable variation in fat content within the grade is also thought to account for lack of uniformity in shrinkage in like cuts of meat cooked by the same methods. Grade differences in shrinkage were considered of significance only when a large number of the same cuts were cooked by the same method. With cooking time expressed as minutes per pound, the effect of grade on the rate of cooking did not appear to be important, although there was a slight trend toward faster cooking in relation to the weight of rib roasts of U. S. Good than of U. S. Plain beef.

The ash constituents of Australian fish, F. W. CLEMENTS and R. C. HUTCHINSON (*Austral. Jour. Expt. Biol. and Med. Sci., 17 (1939), No. 1, pp. 89–92*).—Tabulated data are presented on percentages of edible portion of the moisture, total ash, potassium, phosphorus, sodium, magnesium, calcium, iron, copper, and manganese contents and on the calcium: phosphorus ratio of 45 varieties of Australian fish. Data are also given on the comparative consumption of meat and fish in the various Australian States.

The truth about frozen bread, I, II, W. H. CATHCART (*Food Indus., 11 (1939), Nos. 2, pp. 68, 69, 109, 110, figs. 3; 4, pp. 200, 201, 233, 234, figs. 3*).—In part 1 of this paper the results are reported and discussed with reference to earlier work on the subject of a judging test of bread which had been held for 1 mo. at a temperature of approximately −22° C. and of fresh bread made from the

same formula in the same bread shop. The frozen bread received the preference in 26.7 percent of the 241 votes and the fresh bread in 56.05 percent. Evaluation of the ballots on a preference basis according to the Platt method of sampling gave a total of 392 points for the month-old bread and 477 points for the fresh bread.

Part 2 consists of a summary of studies by the American Baking Institute of the comparative qualities of bread frozen at different temperatures and held for varying lengths of time and of the effect of wrapping the bread. The subjective tests indicated that wrapped bread frozen at —22° remained "good" for as long as 20 days and salable for about 40 days. Lower temperatures prolonged the period in which the bread was considered good, but when the storage period was continued too long an off-flavor developed. The objective tests, which included determinations of swelling power by the Katz method and compressibility by the Platt method, showed the bread to be stale several days before it was pronounced stale by the judges. Both methods are described briefly.

Effect of calcium on plant tissues, Z. I. Kertesz. (N. Y. State Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 18 (1939), No. 6, pp. 176, 187*).—Based on the known ability of calcium salts to unite with pectic acid (demethoxylated pectin) to form insoluble salts or gels, calcium treatment of certain fruits and vegetables before preservation to make the tissues firmer is suggested, with a discussion of the fields where preliminary experiments have indicated the usefulness of such a procedure. These are classified in three groups—canning, freezing, and preserve or jelly making. Under the first, the addition of as little as 0.05 to 0.1 percent of calcium chloride to tomatoes before canning or placing in the can is given as an illustration. In freezing fruits, the treatment should be completed before the freezing commences in order that the calcium might have a chance to diffuse throughout the entire tissue. Calcium treatment is said not only to preserve the natural structure but also to prevent the browning on defrosting of fruits such as apples and peaches. In jelly making, the addition of calcium salts in dilute concentration might not only improve the texture but might also make possible the jellying of fruits which have pectic acid but insufficient pectin. The use of calcium has also made possible the preparation of gels with less than 50 percent sugar.

Making maraschino cherries at home, F. A. Lee (*New York State Sta. Cir. 184 (1939), pp. 8*).—Practical suggestions are given for the selection of cherries, both as to variety and stage of maturity, for making maraschino cherries in the home, with general directions for bleaching and pitting the fruit preliminary to coloring, siruping, and flavoring. Specific directions based on 1 lb. of the pitted cherries are given for the preparation of red and green cherries. Materials and supplies needed are listed, and addresses are given of dealers handling dyes and flavors and cherry-pitting spoons.

Nutritional aspects of milk, W. E. Krauss. (Ohio Expt. Sta.). (*Jour. Milk Technol., 1 (1938), No. 3, pp. 22–26*).—In this paper, which was read at an annual meeting of the International Association of Milk Sanitarians, the attempts which have been made at various experiment stations to increase the content of vitamins C, D, and A in cow's milk through improved feeding, handling, and processing methods are reviewed to illustrate the broader concept of "quality milk" as combining both sanitary and nutritive aspects.

Acid-base balance of cereals and some related food materials, J. Davidson and J. A. LeClerc. (U. S. D. A.). (*Food Res., 3 (1938), No. 4, pp. 393–402*).—The method developed by the authors for determining the acid-base balance of foods by direct titration of the ash, with corrections for sulfur and chlorine

lost during combustion (E. S. R., 74, p. 156), has been applied to cereals and some related food materials with the following results:

All cereals tested, with the exception of yellow corn, had a slightly alkaline ash but an acid balance; buckwheat, an alkaline ash and slightly basic balance; standard wheat bread, a distinctly alkaline ash but acid balance; and soybeans, jackbeans, and potatoes, a distinctly alkaline ash and base balance. The loss of chlorine during ashing was correlated with the acid or base balance, but the corresponding loss of sulfur could not be correlated with either the acid-base balance of the materials or the alkalinity values of the ash. The transformation of phosphorus into metaphosphate and pyrophosphate during combustion was inversely correlated with the alkalinity of the ash. The orthophosphate content of the ash in the cereals, with the exception of white flour bread, fluctuated from 7 to 54 percent of the total phosphorus. The highest value attained was from barley, which had the highest alkalinity value of all of the cereals when recalculated on the basis of 1 percent phosphoric acid. "It is suggested that the significance of the acid-base balance, if any, besides its possible contribution to the acid-base equilibrium of the animal or human system, may lie also in its effect on the end products of mineral metabolism."

Additional nutritional factors required by the rat, J. J. Oleson, H. R. Bird, C. A. Elvehjem, and E. B. Hart. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 127 (1939), No. 1, pp. 23–42, figs. 7*).—The results obtained in studies on several phases of the vitamin B complex, using liver extract in the preparation of all of the concentrates tested, have been brought together in an effort to differentiate further the specific factors of the vitamin B complex.

Four different deficiency symptoms are produced in rats on synthetic diets low in vitamin B complex but adequate in thiamin, riboflavin, choline, and nicotinic acid. These are acrodynia, which can be prevented and cured by crystalline vitamin B_6; paralysis, which is probably the same as previously reported for vitamin B_4 deficiency (E. S. R., 76, p. 565); hemorrhagic disease, which resembles the panmyelophthisis reported by György (E. S. R., 79, p. 713) but which is not prevented by nicotinic acid; and a "spectacled eye" condition, which appears to be somewhat similar to that found in chicks suffering from dermatitis (E. S. R., 75, p. 95). Only the symptoms of acrodynia are prevented and cured by crystalline vitamin B_6.

In discussing the relation of these deficiencies to known members of the vitamin B complex, attention is called to the evidence that eluates, filtrates, and precipitates as designated by different workers may be complex mixtures of active substances. In the studies reported the eluate fraction contains not only the vitamin B_6 but the factors necessary for the prevention of paralysis and the hemorrhagic condition, with very little of the growth factor designated as factor W (E. S. R., 79, p. 137). The filtrate fraction carries in addition to the factor necessary for the prevention of the spectacled eye condition a small amount of factor W and possibly other growth factors, and may also carry the chick antidermatitis factor and nicotinic acid. The alcohol-ether precipitate of Elvehjem et al. (E. S. R., 78, p. 285) and the even more purified fraction of factor W carry vitamin B_6 and probably other factors. It is emphasized in conclusion that each of the factors discussed needs much more study.

The dietary indispensability of valine, W. C. Rose and S. H. Eppstein. (Univ. Ill.). (*Jour. Biol. Chem., 127 (1939), No. 3, pp. 677–684, figs. 4*).—By the use of diets devoid of proteins but containing mixtures of highly purified amino acids, as in previous studies of the same author and his associates (E. S. R., 79, p. 133), valine has been shown to be an indispensable amino

acid. The symptoms of valine deficiency in rats are described as an extreme sensitivity to touch and lack of coordination in movement resulting in a staggering gait. The left foreleg is raised and the head retracted. Motion is rotary, either clockwise or counterclockwise. The symptoms are cured rapidly by the addition of valine to the diet.

Further studies of the calcium content of the body as influenced by that of the food, C. S. Lanford and H. C. Sherman (*Jour. Biol. Chem.*, *126* (*1938*), *No. 1, pp. 381–387*).—In this extension of the studies by Toepfer and Sherman (E. S. R., 78, p. 277) of liberal v. minimal adequate intake of calcium upon the body calcium of the offspring of families on such diets, representative male and female young of female rats on the three diets used in the earlier studies (differing only in their content of calcium salts) were selected at from 28 to 30 days and either killed at once or continued on the diet of the mother until 2, 3, 6, or 12 mo. of age. In the rats sacrificed at 1, 2, and 3 mo. of age, those on the two higher levels of calcium intake showed a much more advanced degree of calcification, both in terms of total amount and percentage of body calcium, than those on the lowest calcium intake. At 6 mo. and 1 yr. of age the differences were smaller but still significant. At full maturity the differences in calcification amounted to between 5 and 10 percent. Although the final percentage of body calcium was the same for the two higher levels of intake, the rate of calcification was somewhat greater on the diet providing 0.8 percent of calcium than on that with 0.64 percent. It is noted that experiments still in progress indicate that the higher calcium content achieved on the two higher diets is advantageous throughout life.

Experiments on the relation of nutrition to the composition of the body and the length of life, H. C. Sherman, H. L. Campbell, and C. S. Lanford (*Natl. Acad. Sci. Proc.*, *25* (*1939*), *No. 1, pp. 16–20, figs. 2*).—This paper includes, in addition to a brief report of the investigation noted above and a discussion of its significance, preliminary findings on similar studies designed to determine the specific effects of changing the levels of intake of vitamin A alone. Attention is called to the fact that each of the modifications of an already adequate dietary which has increased the length of life of the experimental animals has extended the period of adult capacity and vitality rather than the period of physiological old age.

Vitamin A and carotene, XIII–XVI (*Biochem. Jour.*, *31* (*1937*), *No. 1, pp. 155–187, fig. 1*).—In continuation of the series noted previously (E. S. R., 75, p. 885), four papers are presented.

XIII. *The vitamin A reserve of the adult human being in health and disease*, T. Moore (pp. 155–164).—The problem and general plan of this investigation have been noted from a preliminary report (E. S. R., 68, p. 706) covering 320 of the 950 cases studied. The content at autopsy of vitamin A in the livers of persons between the ages of 15 and 59 was determined by the antimony trichloride color test, and the blue values obtained were converted into International Units per gram of wet liver tissue by multiplying by 0.6. The cases were classified by the primary disease causing death, with deaths due to accidents considered as the nearest approach to normal. The values for each class were grouped into three subclassifications of low, medium, and high, according to ascending vitamin A reserves and the means of the middle subgroups used for comparison.

The median value for 40 cases of accidental death for persons dying within 7 days of injury was 220 I. U. per gram of wet liver. Values above this were found in thyroid diseases of different types with a median of 310 I. U. and in diabetes with a median of 300 I. U. per gram. Somewhat lower values, but still above the level of accidents, were cases of poisoning, 170, and hernia, 160

I. U. per gram. A median value of 110 I. U. per gram was obtained for cancer cases, and this value was typical of a chronic disease which does not appear to have a connection with vitamin A deficiency. The vitamin A reserves in other diseases were classified as at the ordinary disease levels if not more than 20 percent below the cancer median and as below the ordinary disease level if more than 20 percent below. Among the diseases belonging to the second of these groups were bronchiectasis and chronic bronchitis, with a value of 80 I. U. per gram, subacute nephritis and peritonitis 75, enteritis and colitis 74, pneumonia 63, empyema and valvular diseases of the heart 60, septic diseases 51, chronic nephritis 25, and kidney and bladder infections 19 I. U. per gram.

It is recognized that the interpretation of these values "is complicated by the difficulty of deciding in any given disease whether low vitamin A reserves, or the general nutritional subnormality which they might imply, are a factor of etiological significance or merely a secondary effect of the disease. It is clear that in some diseases the power of the organism to absorb the vitamin is impaired. On the other hand, it is noteworthy that many of the diseases showing low reserves in the human being are also frequent terminations to experimental vitamin A deficiency in the animal."

XIV. *The vitamin A reserves of the human infant and child in health and disease*, J. B. Ellison and T. Moore (pp. 165–171).—Similar data are reported and discussed for the vitamin A reserves in the livers of 200 children under 15 yr. of age dying by accidents or from various diseases. The variation in the vitamin A reserves of the liver with age was studied by combining the values for the different age groups dying of all causes. In infants from birth to 4 weeks of age the median value was 17 I. U. per gram, from 5 weeks to 3 mo. 14, 4 to 8 mo. 100, 9 to 18 mo. 73, and 19 mo. to 3 yr. 99 I. U. per gram. The median value for a group of healthy children dying by accident between the ages of 4 mo. and 14 yr. was 130 I. U. per gram. In comparison with this value as a standard, high reserves were noted in tuberculosis, moderate in measles, and low in pneumonia, head infections, septic diseases, and heart diseases. Relatively, these values are in good agreement, particularly in septic diseases, with those found in adults. It is noted that the comparatively high value in measles is difficult to reconcile with the finding of one of the authors that vitamin A therapy had a favorable influence on survival rate in measles.

XV. *The influence of the vitamin A reserve on the length of the depletion period in the young rat*, A. W. Davies and T. Moore (pp. 172–178).—In this reinvestigation of the question of the ability of rats to store vitamin A (E. S. R., 73, p. 419), a few animals from two groups of rats from 5 to 7 weeks of age taken from two breeding colonies, one on a diet extremely rich in vitamin A and the other one rather deficient in vitamin A, were killed and the vitamin A reserves of their livers determined by the antimony trichloride color method. The remaining animals in both groups were given a diet deficient in vitamin A, and the exhaustion of their vitamin A reserves was tested by following the weight-increase curves and by killing animals at given intervals and determining the vitamin A content of their livers. After the reserves had been exhausted, as shown by cessation of weight gains and negative results in the antimony trichloride tests, the remaining animals were given halibut-liver oil and the observations continued until weight restoration had taken place.

In the group from the colony on a diet low in vitamin A, weight increases ceased and the antimony trichloride reaction became negative after 5 weeks, while in the other group the weight increases continued for several months and the liver reserves were repeated only gradually. Halibut-liver oil brought about a weight restoration in most cases and an increase in the vitamin A

content of the liver in all cases. These results are thought to "reaffirm the reality of the vitamin A reserve and emphasize the importance in routine vitamin A determinations of using rats which have been reared under conditions ensuring low reserves." Instances of anomalous behavior in rats on high reserves are noted, with the advice that in vitamin A determinations all animals reacting abnormally should be rejected from calculations if lesions sufficient to account for the abnormality are discovered at autopsy.

XVI. *The effect of the administration of large amounts of vitamin A on the vitamin A content of the hen's egg*, E. M. Cruickshank and T. Moore (pp. 179-187).—Experiments at Cambridge University gave evidence that the addition of 10 percent of medicinal-grade cod-liver oil to a low vitamin A basal diet of laying hens approximately doubled the vitamin A potency of egg yolks over that obtained in the basal diet, while the oral administration of 5 g of a vitamin A concentrate in addition to the basal diet increased the vitamin A potency of yolks about 5 times. However, the percentage recovery in eggs of the vitamin A ingested was only 2 and 0.2 for cod-liver oil and the vitamin A concentrate, respectively.

Determinations of the vitamin A content of various organs of hens at the end of the experimental feeding periods revealed a high concentration of vitamin A in the liver and much smaller concentrations in the kidneys, while other organs gave negative results in the case of cod-liver oil feeding and showed only traces of vitamin A in cases of the concentrate feeding.

Destruction of vitamin A by rancid fats, E. J. and J. G. Lease, J. Weber, and H. Steenbock. (Wis. Expt. Sta.). (*Jour. Nutr., 16 (1938), No. 6, pp. 571-583*).—The extent of destruction of vitamin A and carotene as present in halibut-liver oil, egg yolk, and alfalfa by various degrees of rancidity produced by heating, aeration and ozonization, and by admixture with various decomposition products was tested by an indirect method involving the feeding of the preparation to rats during a 5-week period and determining colorimetrically the vitamin A content of their livers at the end of the period.

Pronounced destruction of vitamin A took place with definitely rancid fats but not with fresh fats. Fats heated in air destroyed vitamin A in proportion to the duration and time of heat treatment. Lard heated in an open pan for 5 min. at 240° C. had no effect on vitamin A, but heating at the same temperature for 30 or 90 min. completely destroyed the vitamin. Similar heating in nitrogen prevented the subsequent destruction of the vitamin. Various oxidizing compounds which might occur in rancid fats, including palmitic peroxide, ozonized lard, oxidized oleic acid, and oxidized fatty acids of lard, destroyed the vitamin, but oleic acid fed as 10 percent of the ration had no effect. The destructive effect of certain fats was quite out of proportion to the peroxide value. Other possible constituents of rancid fats tested included chemically pure, straight-chain aldehydes and methyl ketones containing from 7 to 12 carbon atoms, oxidized glycerol, glyceric acid and aldehyde, allyl alcohol, acrolein, acrylic acid, pyruvic acid, and propyl aldehyde. None of these proved effective. The components of rancid fats which caused destruction of vitamin A were not removed by distillation with steam or extraction with alcohol, but were rendered inert to a certain extent by heat. The addition of various antioxidants, such as ascorbic acid, hydroquinone, gallic acid, and ethyl gallate, did not prevent the destruction. Vitamin A was not destroyed when given to rats on an empty stomach even when they were maintained on a ration rich in rancid fat, but was destroyed when mixed with rancid fat in the stomach.

Factors affecting the vitamin B_1 content of yeast, P. L. Pavcek, W. H. Peterson, and C. A. Elvehjem. (Univ. Wis.). (*Indus. and Engin. Chem., 30 (1938), No. 7, pp. 802-805*).—In addition to data on the yields and vitamin B_1

content of different strains of yeast grown in different media, essentially noted from another source (E. S. R., 77, p. 729), this report contains data on the effect of various additions to a glucose-salts medium on the vitamin B_1 content of a strain of bakers' yeast and on the partition of the vitamin B_1 of grains between residue and wort.

The addition of a vitamin B_1 concentrate, crystalline B_1, nucleic acid, or liver extract to the glucose-salts medium greatly increased the vitamin B_1 content of the yeast. In tests in which the vitamin B_1 was added, from 50 to 100 percent was recovered in the yeast crop. When yeast was grown without aeration, the vitamin B_1 content was about double that produced in an aerated medium, but most of the increase came from the inoculum. About 70 percent of the vitamin B_1 content of the grain was found in the wort. Sterilization of the wort for 45 min. at 15 lb. pressure per square inch appeared to destroy about 20 percent of the extracted vitamin, which, however, was reconstituted by the yeast from the decomposition products.

Quantitative measurement of vitamin B_1 by the thiochrome reaction, H. G. K. Westenbrink and J. Goudsmit (*Nature [London], 142 (1938), No. 3586, pp. 150, 151*).—Attention is called to a procedure first described by Westenbrink and Jansen for determining separately by the thiochrome method the two forms of vitamin B_1 now recognized—vitamin B_1 (aneurin or thiamin) and cocarboxylase (aneurin- or thiamin-pyrophosphoric acid). The method depends upon the fact that thiochrome is extracted quantitatively from the aqueous reaction mixture by isobutanol, while the thiochrome-pyrophosphoric acid remains in the aqueous layer. In applying the method to animal tissues, both the aqueous and isobutanol layers show a blue fluorescence even without oxidation by ferricyanide. It is said that this blank fluorescence may be greatly reduced by digesting the tissue proteins with pepsin previous to the adsorption of the vitamin.

The aneurin content of animal tissues was found to be very low as compared with the cocarboxylase content, as shown by the following figures for normal rat tissue: Liver, 7–13 μg. cocarboxylase, less than 2 μg. aneurin; muscle, 1.5–5 μg. cocarboxylase, less than 0.5 μg. aneurin; kidney, 11 μg. cocarboxylase, 0.5 μg. aneurin; brain, 6 μg. cocarboxylase, less than 0.3 μg. aneurin.

Quantitative measurement of vitamin B_1 and its phosphoric esters and their synthesis in animal tissues, S. Ochoa and R. A. Peters (*Nature [London], 142 (1938), No. 3590, p. 356*).—It is noted that estimates of the two forms of vitamin B_1 designated above have been made on rat and pigeon tissues by the use of yeast enzymes with the same general conclusion that there is more cocarboxylase than vitamin B_1 in most tissues, although the reverse has been found to be true of muscle tissues. The authors call attention to the fact that in their method of determining cocarboxylase only the diphosphoester is measured, while in the method of Westenbrink and Goudsmit it is possible that the monoester also is included. It is announced that under optimum conditions, which are enumerated, liver slices may convert from 25 to 30 percent of vitamin B_1 into cocarboxylase in 30 min. at 38° C.

Basal diets for vitamin B_1 determination, O. L. Kline, C. D. Tolle, and E. M. Nelson. (U. S. D. A.). (*Science, 88 (1938), No. 2291, p. 508*).—Sulfite treatment of yeast to destroy vitamin B_1 is recommended for the preparation of rations devoid of vitamin B_1 but containing adequate amounts of the other members of the vitamin B complex. The ration used by the authors consisted of sucrose 71 percent, vitamin B_1-free casein 18, salt mixture 4, fat 5, and cod-liver oil 2 percent, with various proportions of sucrose replaced by the sulfite-treated yeast. This was prepared by adding 400 cc. of 0.1 percent sodium sulfite to 50 gm. of dried yeast in a 500-cc. wide-mouth bottle, introducing SO_2

until a pH of 4 was reached, and then stoppering the bottle and allowing it to stand 5 days, after which the contents were dried on purified casein. Rats fed the basal ration containing 5 or 15 percent of the sulfite-treated yeast and receiving in addition crystalline vitamin B_1 grew as rapidly as animals receiving the same quantity of untreated yeast in the basal diet.

Stability of vitamin B_1 of vacuum-dried animal tissues during storage, A. ARNOLD and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Food Res.*, *3* (*1938*), *No. 4*, *pp. 367–372, figs. 2*).—Several vacuum-dried animal tissues in vacuum-packed cans were tested for vitamin B_1 by the chick-assay method of Elvehjem soon after being packed and again after storage for 2 yr. at room temperature. Initial and final values obtained were as follows: Beef kidney, 5 and 4 International Units per gram dry basis; beef spleen, 2 and 2; beef lung, 2 and 1.6; and hog brain, 1.6 and 1.3 I. U. per gram dry basis, respectively. The loss in vitamin B_1 in all but the beef spleen was calculated to amount to approximately 20 percent.

A test for vitamin-C deficiency, M. VAUTHEY (*Lancet* [*London*], *1939*, *1*, *No. 12*, *pp. 695, 696*).—In the opinion of the author, an accurate estimate of vitamin C metabolism can be obtained by determining the quantity of ascorbic acid excreted in the urine during the hour after the first morning voiding and before food is taken. In normal subjects this amount, designated as "basic ascorburia," has been found to range from 0.92 to 1.04 mg., with an average value of 1 mg. The degree to which these normal values are raised by the administration of large doses of vitamin C can be used as a test for vitamin C deficiency on the assumption that when the value reaches 2 mg. the subject may be considered to be saturated, and the amount of ascorbic acid that must be given to reach this figure is a measure of the subject's vitamin C storage. In practice, ascorbic acid is given intramuscularly in daily doses of 600 mg. for adults and 300 mg. for children at 8 a.m., immediately after the collection of urine for determining the basic ascorburia. In the normal subject this value is reached on the fourth day. If the value is reached on the first day, after only 600 mg. has been given, a very high store of vitamin C is indicated; in 2 days, a high store; in 3 days, a normal store; in 4 days, a slight deficiency; in 5 days, a moderate deficiency; in 6 days, a severe deficiency; and in more than 6 days, true avitaminosis. Certain advantages of the test over those in general use are pointed out.

Complement and ascorbic acid in human scurvy.—An experimental study, E. E. ECKER, L. PILLEMER, J. J. GRIFFITTS, and W. P. SCHWARTZ (*Jour. Amer. Med. Assoc.*, *112* (*1939*), *No. 15*, *pp. 1449–1452*, *figs. 2*).—A study is reported of the ascorbic acid content and complement titer of the serum of two adult patients with typical scurvy before and during treatment with crystalline ascorbic acid administered orally in graded doses. In both patients the initial complement titers were very low, 0.07 and 0.08 cc. of a 1:15 serum dilution, and the ascorbic acid contents of the serum and urine were negligible. Capillary resistance tests were also negative. The ascorbic acid was given in daily doses of 100 mg. for 2 days, followed by 250, 500, 750, and 1,000 mg., the final dose being repeated daily for another week. Both serum complement and ascorbic acid increased rapidly. The complement reached its maximum at about 0.02 cc. of 1:15 serum dilution on the eleventh day in one subject and on the seventh in the other. At this point the ascorbic acid content of the serum was 1.2 mg. per 100 cc. in both cases. Further dosage failed to increase the complement titer, although the ascorbic acid content of the serum continued to rise. Since the complement activity of the serum can be determined readily, the suggestion is made that the test "may well replace the quantitative chem-

ical estimation of the ascorbic acid in those instances in which both methods cannot be utilized."

The stability of vitamin D (a) as crystalline calciferol in oily solution, (b) in cod-liver and halibut-liver oils, H. M. Bruce, E. W. Kassner, and G. E. Phillips (*Quart. Jour. Pharm. and Pharmacol., 11 (1938), No. 1, pp. 46–52*).—By biological assay with rats the stability of crystalline calciferol in five different oily solvents was determined. The calciferol with a value of 40,000 International Units of vitamin D per milligram had a potency of 41,100 and 45,300 I. U. per gram in two samples of halibut-liver oil and 45,700 and 48,200 I. U. in two of cod-liver oil, respectively, and 32,400 in liquid paraffin with subdilution in the paraffin and 41,100 I. U. per gram in liquid paraffin with subdilution in olive oil. Storage of the calciferol in oil in nitrogen-filled bottles at 0° C. resulted in a loss of vitamin D activity ranging from 28 percent for one halibut-liver oil sample after 14 mo. to 7 percent for one cod-liver oil sample after 19 mo. In two samples of liquid paraffin the vitamin D activity of the calciferol showed gains of 13 and 16 percent, respectively.

Standard methods of vitamin D bioassay of milk, H. T. Scott et al. (*Amer. Pub. Health Assoc. Yearbook, 1938–39, pp. 54–59*).—This report of a committee of the Foods and Nutrition Section of the American Public Health Association describes in detail a standard procedure for determining the vitamin D content of milk biologically by the line test, incorporating the principles outlined in the *U. S. Pharmacopoeia*, XI, for the vitamin D assay of cod-liver oil. Optional modifications as suggested by the Association of Official Agricultural Chemists are included.

Vitamin K: Its properties, distribution, and clinical importance.—A preliminary report, A. M. Snell (*Jour. Amer. Med. Assoc., 112 (1939), No. 15, pp. 1457–1459*).—This preliminary report, prepared at the request of the Council on Pharmacy and Chemistry of the American Medical Association, reviews briefly the literature on vitamin K, designated in an introductory statement by P. N. Leech, secretary of the Council, as "a principle useful in certain hemorrhagic conditions."

Further observations on the use of vitamin K in the prevention and control of the hemorrhagic diathesis in cases of jaundice, H. R. Butt, A. M. Snell, and A. E. Osterberg (*Mayo Found. Med. Ed. and Res., Proc. Staff Mtgs. Mayo Clinic, 13 (1938), No. 48, pp. 753–764, figs. 2*).—The oral administration of an ether-extracted concentrate of vitamin K from alfalfa meal, together with bile salts, to jaundiced patients was followed by an elevation in the quantitative level of prothrombin in the circulating blood and a reduction in the elevated prothrombin clotting time. When the concentrate and the bile salts were given before and after surgery to 28 jaundiced patients, only 3 bled postoperatively as compared to 9 out of 14 patients who did not receive the preoperative treatment.

Present status of clinical tests for vitamin deficiency, W. H. Eddy et al. (*Amer. Pub. Health Assoc. Yearbook, 1938–39, pp. 42–53*).—This report of the American Public Health Association's Committee on Nutritional Problems contains summaries with critical discussion of the clinical tests now in use for detecting vitamin deficiency. Those for vitamin A include dark adaptation and blood vitamin A and carotene tests; for vitamin B_1, thiochrome, yeast fermentation, and bradycardia tests; for vitamin C, blood and urine tests, with hitherto unpublished data, and intradermal tests; and for vitamin D, blood calcium, phosphorus, and phosphatase tests. A list of 74 references is appended.

Biochemistry and pathology of avitaminosis.—III, Enzymic efficiency in deficiency diseases, B. Sure, M. C. Kik, K. S. Buchanan, R. T. Harrelson, Jr., and R. M. Theis (*Arkansas Sta. Bul. 373 (1939), pp. 20*).—In continuation

of the series noted previously (E. S. R., 80, p. 140), this bulletin summarizes the results obtained in a long-time investigation, different phases of which have been noted from progress reports and journal articles, on the influence of various vitamin deficiencies on blood and tissue enzymes. The material includes methods employed for the determination of blood and tissue enzymes; enzymic efficiency in deficiencies of vitamin A and of vitamin D (E. S. R., 79, p. 140); influence on the concentration of blood and tissue enzymes of a deficiency of the vitamin B complex (E. S. R., 74, p. 890), vitamin B_1, vitamin G (including riboflavin and vitamin B_6), and vitamin A and the vitamin B complex (E. S. R., 79, p. 140); peptic digestion in vitamin B deficiency; and influence of repeated depletions of vitamins A and B_1 on concentration of digestive enzymes.

The oxygen uptake of tissues in vitamin deficiencies, B. SURE and J. B. DEWITT. (Univ. Ark.). (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 287–298*).—The oxygen uptake studies here reported constitute a continuation of a series of investigations on enzymic efficiency in avitaminosis (E. S. R., 79, p. 140). Measurements were made with the Barcroft apparatus, following essentially the technic of Peters et al. as modified by Sherman and Elvehjem (E. S. R., 76, p. 840) of the oxygen uptake of several tissues of white rats on diets deficient in vitamin B_1, all of the components of the vitamin B complex, and vitamin A, respectively. The experiments were carried out by the paired feeding method, with matched litter mates on the same diets, alone and supplemented with the respective vitamins. The results expressed as percentage reduction in oxygen uptake are summarized as follows:

"Deficiency of the vitamin B complex: Kidney, 21 groups, −15 percent; heart, 9 groups, −18 percent. Vitamin B_1 deficiency associated with polyneuritis: Cerebrum, 16 groups, −16 percent; heart, 14 groups, −17 percent; kidney, 19 groups, −19 percent. Vitamin A deficiency: Cerebrum, 13 groups, −14 percent; heart, 7 groups, −19 percent. Neither the extent of loss of weight, the severity of polyneuritis, nor the severity of ophthalmia had any influence on the quantitative reduction of oxygen uptake of either the kidney, heart, or cerebrum of the albino rat on diets deficient in vitamin B complex, vitamin B_1, or vitamin A, respectively."

The results with vitamin B_1 are interpreted as indicating that the disappearance of pyruvate following minute vitamin B_1 additions is associated with a decarboxylation process with acetaldehyde and carbon dioxide as intermediate steps in the carbohydrate metabolism. No theory is advanced concerning the mechanism involved in the reduction of the oxygen uptake of the brain and heart in vitamin A deficiency.

Anemia studies with dogs, V. R. POTTER, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 155–173*).—The studies reported were undertaken to investigate further the mechanism by which copper acts as a catalyst for iron in the synthesis of hemoglobin and to attempt to correlate the results obtained in the authors' laboratory in studies on nutritional anemia in rats (E. S. R., 67, p. 90) with those reported by Whipple and associates (E. S. R., 74, p. 731) on hemorrhagic anemia in dogs. Growing dogs were placed on milk diets supplemented only with two drops of percomorph oil a week and after anemia had developed were given supplements of iron and copper in various combinations to a maximum of 30 mg. of iron and 2 mg. of copper daily. Manganese in the amount of 2 mg. daily was given in all cases. Hemoglobin regeneration took place at such a slow rate over a period of 3 mo. as to suggest that either the levels of iron and copper were too low or that a third and unknown factor was lacking. After the

hemoglobin levels had approached normal, two of the dogs were made anemic by bleeding and the rest were maintained further on the whole milk alone. The dogs which were made anemic were unable to form any hemoglobin on milk alone and responded poorly to a dose of 30 mg. a day of iron alone. When 4 mg. of copper per day were given in addition to the iron, hemoglobin regeneration proceeded rapidly. Blood copper determinations showed that an increase in blood copper was not associated with anemia or with a low iron content in the blood but with iron administration. "It is concluded that the canine species should be included among those which require copper for hemoglobin regeneration, and that the need for copper for hemoglobin synthesis is probably a general biological property."

Hemoglobin production in anemia limited by low protein intake: Influence of iron intake, protein supplements, and fasting, P. F. Hahn and G. H. Whipple (*Jour. Expt. Med., 69 (1939), No. 2, pp. 315–326*).—Experimental observations over a long period of time are reported for the hemoglobin production in four anemic dogs on limited protein intake with iron administered orally and intravenously. These observations show that dogs made anemic by blood withdrawal cannot produce the expected new hemoglobin with iron alone given either orally or intravenously when the protein intake is held at low levels. In the condition of protein limitation, the proteins of salmon muscle, bananas, and carrots are so well utilized that only from 7 to 8 gm. of these food proteins are required to produce 1 gm. of new hemoglobin. These experiments are thought to prove definitely that the iron content of liver is not entirely responsible for its potency in anemia due to hemorrhage.

Iron ascorbate in the treatment of anemia, D. G. Friend (*New England Jour. Med., 219 (1938), No. 23, pp. 910–912, fig. 1*).—In an investigation of the effectiveness of iron ascorbate in the treatment of various types of anemia, 21 patients were studied, using doses of an iron content of 10 mg. intravenously and 200 mg. orally. In 3 patients with anemia due to blood loss, the intravenous injection of iron ascorbate gave a daily hemoglobin increase of 1.2 percent. In 15 patients with anemia resulting from chronic blood loss, nutritional lack, or ideopathic hypochromic anemia, the average daily gain of hemoglobin amounted to 1.1 percent. In 3 patients with hemoglobin values below 50 percent, the daily gain in hemoglobin was 1.5 percent. The red cell count always began to rise before the hemoglobin.

Patients with a history of responding poorly or not at all to iron medication showed no more favorable response to the iron ascorbate, with the exception of one with advanced lymphomatous involvement who had a 10–25 percent increase in hemoglobin and an 8 percent increase in reticulocytes following daily intravenous injections furnishing 20 mg. or more of iron. The progress of the disease was not checked, however, and the patient died 1 mo. after treatment had begun. On autopsy the liver was found to have an iron content of 726 mg. per kilogram, in comparison with normal values of from 100 to 270 mg. In two patients who had become sensitive to iron medication, iron ascorbate was well tolerated.

In four cases of human scurvy, treatment with iron ascorbate in 900-mg. doses for 5 days raised the blood ascorbic acid from 0.2 mg. per 100 cc. to a normal value of 1.3 mg. or more. These results confirm those of Pijoan (E. S. R., 78, p. 573) in indicating definite antiscorbutic properties of iron ascorbate.

Review of nicotinic acid as a therapeutic agent, T. D. Spies (*Med. Woman's Jour., 46 (1939), No. 4, pp. 97–100*).—In this review of recent developments in the use of nicotinic acid and certain of its derivatives in the treatment of pellagra, it is emphasized that synthetic nicotinic acid, thiamin hydrochloride,

and riboflavin, although invaluable as therapeutic agents, cannot replace a liberal and well-balanced diet. An extensive list of references to recent literature on the use of nicotinic acid and its derivatives in the treatment of human pellagra and canine blacktongue, and in experimental work on rats, chicks, and pigs is appended.

Failure of nicotinic acid to prevent nutritional cytopenia in the monkey, P. L. Day, W. C. Langston, and W. J. Darby. (Univ. Ark.). (*Soc. Expt. Biol. and Med. Proc.*, *38* (*1938*), *No. 5*, *pp. 860–863*).—In continuation of previous studies (E. S. R., 75, p. 426), the authors demonstrated on five monkeys maintained on the vitamin G-deficient diet supplemented by 10 and 50 mg. of nicotinic acid that the factor necessary to prevent nutritional cytopenia in the monkey is not identical with nicotinic acid. "Vitamin M" is proposed as the name of the factor contained in yeast and liver extract which prevents the condition.

Nutritional cytopenia (vitamin M deficiency) in the monkey, W. C. Langston, W. J. Darby, C. F. Shukers, and P. L. Day. (Univ. Ark.). (*Jour. Expt. Med.*, *68* (*1938*), *No. 6*, *pp. 923–940*, *pl. 1*, *figs. 5*).—In a discussion of the findings of the study noted above from a preliminary report, the authors present hematological and weight data on 22 test monkeys. The monkeys receiving the basal diet alone or supplemented by nicotinic acid, riboflavin, and thiamin chloride developed the "vitamin M" syndrome characterized by anemia, leukopenia, and loss of weight. The addition of either 10 gm. dried brewers' yeast or 2 gm. liver extract (Cohn fraction G) to the basal diet supported good growth, normal body development, and a normal blood picture over a period as long as 2 yr. in some of the monkeys.

Food intake and gastro-intestinal motility in the albino rat during chronic CO asphyxia, C. A. Patterson, E. Smith, and H. B. Hale. (Iowa State Col.). (*Soc. Expt. Biol. and Med. Proc.*, *39* (*1938*), *No. 3*, *pp. 509–511*, *fig. 1*).—Chronic carbon monoxide asphyxia was found to decrease the food intake and inhibit gastrointestinal peristalsis in rats.

TEXTILES AND CLOTHING

A new microphotometer for analyzing X-ray diffraction patterns of raw cotton fiber, E. E. Berkley and O. C. Woodyard. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, *10* (*1938*), *No. 8*, *pp. 451–455*, *figs. 7*).—A microphotometer for measuring X-ray diffraction patterns, successfully used to measure patterns of raw cotton fibers, consists of a constant light source focused on the pattern, a measuring device composed of a photoelectric cell and galvanometer system, and a compound mechanical stage for holding and moving the patterns under the light beam while measuring them. The instrument was found to be stable and to show a high degree of precision in repeated measurement of the same X-ray diffraction of raw cotton fibers.

A coefficient of correlation of 0.95 between single X-ray patterns from each of 30 different cottons and their Chandler strength was obtained when the samples were photographed under tension. Lower correlations were obtained when no tension was used. It is pointed out that these results indicate that the X-ray method may be used with considerable precision to estimate the strengths of ungraded raw cotton.

High drafting in cotton spinning: Selected references, compiled by O. M. Shipley (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 3* (*1939*), *pp. 12*).—Selected references are included from Cotton Literature and its predecessor Current Literature on Cotton.

Report on development and use of rayon and other synthetic fibers, C. H. Robinson, R. J. Cheatham, D. F. J. Lynch, and H. P. Holman (*U. S. Dept. Agr., 1938, MC-38, pp. [4]+50, figs. 5*).—This report of a committee from the Bureaus of Agricultural Economics and Chemistry and Soils describes and discusses the manufacturing processes, trends in production, sources of cellulose, the uses and factors influencing the use of rayon, quantities of rayon and other fibers consumed in the United States, uses for which rayon is not suited, and other synthetic fibers.

Breaking strength, elongation, and folding endurance of films of starches and gelatin used in textile sizing, M. S. Furry (*U. S. Dept. Agr., Tech. Bul. 674 (1939), pp. 36, figs. 11*).—In this continuation of the author's studies on the comparative merits for textile sizing of starches from different sources (E. S. R., 67, p. 349; 69, p. 764; 76, p. 731), breaking strength, total elongation, and folding endurance were measured on films made from wheat, dasheen, corn, rice, sweetpotato, canna, and potato starches and from gelatin used alone and in combination with borax, glycerin, soap, and sulfonated castor oil. Fabrics sized with cornstarch- and gelatin-sizing mixtures were tested for stiffness, breaking strength, and total elongation, and the relation of these fabric properties to those of starch films was studied.

Films of the seven starches used increased in breaking strength as the film thickness increased, but at the same thickness showed no difference in breaking strength. Borax and glycerin added to the pastes decreased, and sulfonated castor oil and soap increased, the strength of the starch films. Differences in strength of fabrics sized with the different starch pastes were due to the amount and distribution of the adhering starch rather than to the variety of starch.

Gelatin films had greater breaking strength than the starch films tested. Borax and sulfonated castor oil increased the strength of the films, soap had little effect, and glycerin decreased the strength. In fabrics sized with cornstarch and with gelatin, borax, glycerin, and, with one exception, sulfonated castor oil increased, and soap decreased the strength.

Cornstarch films showed the least elongation, followed by dasheen, wheat, rice, sweetpotato, canna, and potato starch films. The same order held for fabrics sized with these starches. Glycerin and sulfonated castor oil increased, and borax decreased the elasticity of the films. Gelatin films stretched more than starch films, but fabrics sized with gelatin showed less elasticity than those sized with starch. In general, soap and sulfonated castor oil decreased, and glycerin increased the elasticity of fabrics sized with starch and gelatin mixtures.

The folding endurance of starch films decreased in the order canna, potato, sweetpotato, corn, rice, wheat, and dasheen, and in each starch decreased with increasing thickness. Sizing ingredients decreased the folding endurance of the starch films in the increasing order of sulfonated castor oil, glycerin, soap, and borax. Gelatin films had greater folding endurance than canna-starch films. Borax increased, and glycerin, sulfonated castor oil, and soap decreased the stiffness of both starch- and gelatin-sized fabrics.

The influence of position isomerism in azo dyes upon their fastness to light and washing, M. E. Griffith and W. R. Brode (*Ohio Sta. Bul. 601 (1939), pp. 21, figs. 8*).—In this study, a series of dyes prepared by D. R. Eberhart by the diazotization of orthosulfanilic acid, metanilic acid, or parasulfanilic acid coupling to form the monoazo dyes with the available naphthylamines and their monosulfonated derivatives was tested to determine the influence of the position of the sulfonic acid group in both the benzene and naphthalene nucleus and the comparative effects of the presence and the position of the hydroxyl and amino groups in the naphthalene ring. Duplicate samples of scoured white wool cash-

mere were dyed with the series of dyes and subjected to light and washing tests and color analyses according to the procedure used in a previous study of another series of dyes (E. S. R., 75, p. 572). The results are reported in tables and graphs and discussed with respect to absorption spectra, exhaustive and washing fastness properties, darkening, light fading, and the utility factor.

Hosiery for women: A buying guide, M. Smith (*U. S. Dept. Agr., Misc. Pub. 342 (1939), pp. 23, figs. 44*).—Consumer information is presented through photographs with brief accompanying descriptions on hosiery selection with respect to suitability for the occasion; types of construction; size and fit; reinforcements; types of cotton, wool, and rayon hose; weights in terms of thread and gage; and on reasons why hose wear out.

MISCELLANEOUS

Federal, State, and local administrative relationships in agriculture, C. R. Ball (*Berkeley: Univ. Calif. Press, 1938, vols. 1, pp. X+461; 2, pp. XI+463–1139*).—The administrative interrelationships arising between Federal, State, and local agencies are discussed. Volume 1 includes a description and discussion of the principles, advantages, and practices of cooperation between official agencies, and chapters dealing with the scope, agencies, and fields of cooperation in research as to climate, soils, agricultural chemistry, and animal industry. Volume 2 deals with plant industries, agricultural education, agricultural engineering, and agricultural economics.

University of Alaska Agricultural Experiment Station, College, Alaska, 1937: Progress report, January–December, L. T. Oldroyd (*Alaska Sta. Bul. 7 [1938], pp. 35, figs. 11*).—The experimental work reported is for the most part noted elsewhere in this issue. Meteorological data are included.

Eighteenth Annual Report [of the Georgia Coastal Plain Station], 1938, S. H. Starr (*Georgia Coastal Plain Sta. Bul. 29 (1938), pp. 137, figs. 22*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of agricultural research and other activities of the Western Washington Experiment Station for the fiscal year ended March 31, 1938, J. W. Kalkus (*Western Washington Sta. Rpt. 1938, pp. 46*).—The experimental work reported is for the most part noted elsewhere in this issue.

Fiftieth anniversary, 1888–1938 (*[Connecticut] Storrs Sta. Bul. 228 (1938), pp. 64, figs. 11*).—This contains the anniversary program of July 27 and 28, 1938, including the following papers: Milestones and Monuments in the History of the Storrs Agricultural Experiment Station, by W. L. Slate (pp. 6–16); The Place of an Agricultural Experiment Station in the Economy of a Commonwealth, by R. E. Buchanan (pp. 17–42); Dreams, Goals, Deeds, by J. L. Hills (pp. 43–51); Wilbur O. Atwater, by C. W. Atwater (pp. 53, 54); Dr. H. W. Conn, by W. M. Esten (pp. 55–57); The Middle Ten Years, 1904–1914, by C. Thom (pp. 59–61); and C. L. Beach, by J. L. Hills (pp. 63, 64).

Fifty years' achievement in agricultural investigations, R. T. Prescott (*Nebraska Sta. Cir. 60 (1939), pp. 79, figs. 29*).—Some of the outstanding accomplishments in the various fields are briefly summarized.

Fifty years of progress on dominion experimental farms, 1886–1936 (*Ottawa: Govt., 1939, pp. 158, figs. 62*).—This history of the work and personnel is followed by a review of the various divisions and branch units.

The progress of agricultural science in India during the past twenty-five years, W. Burns (*Imp. Council Agr. Res. [India], Misc. Bul. 26 (1939), pp. [3]+44*).—This is a review of progress in the various fields. A bibliography is appended.

NOTES

Alabama Polytechnic Institute.—A building program embracing 14 new buildings and the first unit of an athletic stadium is under way in connection with allotments of nearly $1,500,000 of W. P. A. funds. Among the items are $150,000 for a two-story classroom and laboratory building for the veterinary school, $100,000 for an addition to the library, $560,000 for girls' dormitories, $38,500 for a home economics practice house, a $100,000 infirmary, a $100,000 physical education building, a new engineering building, and a $200,000 general classroom building.

Arkansas University and Station.—Dr. W. R. Horlacher, head of the department of animal industry, has been appointed dean of the College of Agriculture and director of the station and the extension service beginning July 1. H. E. Thompson, head of the U. S. D. A. Farm Security Administration in Arkansas, has been appointed assistant director of the extension service. Other appointments include as technical assistants W. F. Farris and A. Clarence Smith at the Cotton and Rice Substations, respectively.

Delaware University and Station.—George L. Schuster, professor of agronomy and research agronomist, has been appointed director of the station. Dr. J. M. Watkins has been appointed assistant professor of agronomy and assistant research agronomist effective August 1.

Iowa College and Station.—Blair Converse, head of the department of technical journalism in the college and bulletin editor of the station for the past 12 years, died May 18 at the age of 46 years. In the field of journalism he had made a wide acquaintance among newspapermen, editors, publishers of journals, and journalism teachers, and was president in 1937 of the American Association of Teachers of Journalism. He was joint author of several journalism texts. His former students and friends have contributed approximately $1,500 toward a Blair Converse student memorial loan fund to be available to journalism students attending the college.

Dr. George F. Stewart has been appointed professor of poultry husbandry and will take up a new line of investigation on poultry products. A. J. G. Maw has been appointed assistant professor of poultry husbandry effective August 15 for both teaching and research.

Kansas College and Station.—Willard Hall, the new physical science building named in honor of Dr. J. T. Willard, has been completed at a cost of approximately $750,000. It is 307 ft. long by 91 ft. wide with a full basement and three floors and a central tower with a fourth floor which will house the meteorological laboratory. The station laboratories are located in the basement and will provide chemical facilities for work in soils, dairying, meats, nutrition, crops, poultry, and related fields.

A swine nutrition laboratory, 109 by 22 ft. in size and of frame construction, has been built at a cost of $2.500 for use in conjunction with technical studies of the mineral requirements of growing pigs.

Dr. C. O. Swanson, head of the department of milling industry, resigned September 1 to devote his full time to research. and has been succeeded by Dr. E. G.

Bayfield, cereal technologist in charge of the soft wheat quality studies of the U. S. D. A. Bureau of Plant Industry in cooperation with the Ohio Station. Dr. W. H. Riddell, associate professor of dairy husbandry and dairy products, resigned May 15 to become head of the department of dairy husbandry in the Arizona University and Station. Dr. R. K. Larmour, professor of milling industry, resigned June 30 to return to the University of Saskatchewan.

Louisiana Station.—Dr. D. M. Seath, extension assistant professor of dairy husbandry in the Kansas College, has been appointed dairy husbandman in charge of research. I. J. Becnel has been appointed assistant entomologist vice B. A. Osterberger, who died May 20.

Massachusetts College.—Dr. Frank A. Waugh, head of the department of landscape architecture, has retired with the title of emeritus and has been succeeded by Raymond H. Otto.

Missouri University and Station.—The Rockefeller Foundation has recently made a grant of $100,000, most of which is to be used for a genetics building. This building is to be constructed at an early date on the main campus, and greenhouses will be provided in connection with it.

A spectroscopic laboratory, fitted up with the most modern equipment, is being established at the university to serve the various departments interested, but particularly those in the College of Agriculture. Dr. V. R. Ells has been appointed in charge of the laboratory.

Dr. William B. Drew has been appointed assistant professor of botany to give particular attention to ecology and to make a special study of the ecology of pastures in connection with the pasture research under way.

New York State Station.—Action of the State legislature has resulted in a decrease in the total funds available to the station for the current year, exclusive of Federal allotments, of $24,815.

William P. Wheeler, who joined the station staff as first assistant to the director on January 1, 1888, and retired in 1929 as associate in research (animal husbandry), died April 29.

Cornell University and Station.—E. A. White, professor and head of the department of floriculture and ornamental horticulture, retired July 1 after 26 years of active service.

North Dakota Station.—The following assistants have been appointed: Paul E. Johnson in animal nutrition, Thomas E. Long in agricultural engineering, Phillip Vardiman in animal pathology, and L. D. Sibbitt in cereal technology.

Rhode Island College and Station.—Dr. Burt Laws Hartwell, associated with the institution as chemist and agronomist from 1891 to 1928 and director of the station from 1912 to 1928, died at Edgewood, R. I., on July 13 at the age of 74 years. A native of Littleton, Mass., he was graduated from the Massachusetts College in 1889, received the M. S. degree in 1890, and served as assistant chemist in the Massachusetts Station from 1889 to 1891. He received the Ph. D. degree from the University of Pennsylvania in 1903.

Dr. Hartwell was widely known as an agronomist and chemist, especially in connection with his pioneer studies in conjunction with Dr. H. J. Wheeler. He was elected a fellow of the American Society of Agronomy in 1926 and had also been active in the Society for the Promotion of Agricultural Science and the Association of Official Agricultural Chemists. He was the author of many articles of scientific and popular scope and in recent years had conducted a farm column for the *Providence Journal*.

Virginia Station.—Some 60 botanists, representing, among others, Harvard, Smith, Cornell, New York Botanical Gardens, Ohio State, New Jersey, West Virginia, Cincinnati, Tennessee, North Carolina, North Carolina State, and several Virginia institutions, attended a botanical conference and foray held June 15 to 18 under the auspices of the State experiment station at Blacksburg and the biological station of the University of Virginia at Mountain Lake.

Washington Station.—Recent appointments include E. J. Kreizinger as assistant in farm crops vice Wilford Hermann, resigned; Dwight F. Forsyth as seed analyst vice Dr. Elizabeth M. Hermann, resigned; and C. E. Nelson as assistant in agronomy at the Irrigation Substation.

New Journals.—*Palestine Journal of Botany* is being issued in two series. The Rehovoth series appears semiannually from the Agricultural Research Station at Rehovoth. The Jerusalem series is edited by the botanical staff of the Hebrew University, Jerusalem, and appears quarterly. Its initial issue contains about a dozen articles, among which is The Effect of Hetero-auxin on Root Formation by Cuttings and on Grafting, I. M. Evenari (W Schwarz) and E. Konis; Studies in Palestinian Lentils—II, The Varieties of the Cultivated Common Lentil in Palestine, D. V. Zaitschek; and The Influence of the Water Extract of Wheat Seeds Upon Their Germination and Growth, and The Inhibition of Germination and Root Formation by Copper Sulfate and the Elimination of the Inhibitory Effect, both by G. Mosheov, killed by the Arabs on August 17, 1936, at the age of 23 years.

Chromosoma, a journal for cell nuclei and chromosome research, is being published as Section B of *Zeitschrift für Zellforschung und Mikroskopische Anatomie* by Julius Springer at Linkstrasse 22–24, Berlin, W 9. The initial number contains eight original articles, of which the following are in English: The Measurement of Packing and Contraction in Chromosomes, by C. D. Darlington and M. B. Upcott; The Rate of Movement of Chromosomes on the Spindle, by H. N. Barber; The Nuclear Cytology of the Grass Mite, *Pediculopsis graminum* (Reut.), With Special Reference to Karyomerokinesis, by K. W. Cooper; Structural Hybridity in *Cimex* L., by H. D. Slack; and Competition for Chiasmata in Diploid and Trisomic Maize, by K. Mather.

La Rivista Forestale Italiana has replaced *L'Alpe* and *La Montagna Italiana*, and is published monthly by the State Poligraphical Institute at Roma. The initial number contains several technical articles, among which are the following: The Forest Map of Italy, by A. Brengola; Forest Races and Their Origin, by A. Pavari; The Cultural Treatment of New Forest Plantings, by A. Merendi; Recent Information on the Classification of Poplars, by R. Ciferri; and Economic Conditions Affecting Italian Forestry Production, by P. Carloni.

Boletin de Ganaderia is being published by the Ministry of National Economy at Bogotá, Colombia. The initial number contains the following articles: The Consumption, Production, and Dairy Population of Colombia, by R. V. Reyes; The Zebu, by A. L. Herran; and The Work of Our Regional Veterinarians, by C. H. Hernández.

Veterinary Digest is being published monthly for 7 months of the year by students of the Ontario Veterinary College. The initial number consists largely of abstracts of current veterinary literature.

Svenska Vall- och Mosskulturföreningens Kvartalsskrift is being published quarterly at Uppsala, Sweden, replacing *Svenska Mosskulturföreningens Tidskrift* and *Svenska Betes- och Vallföreningens Årsskrift*.

EXPERIMENT STATION RECORD

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THE SEVENTH WORLD'S POULTRY CONGRESS

By E. C. Elting
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The significant place which the poultry industry holds in our present-day agriculture was strikingly demonstrated at the Seventh World's Poultry Congress held at Cleveland, Ohio, July 28 to August 7, 1939. The great throngs which crowded the exhibit halls and attended the many public gatherings of the Congress strongly attested the popular interest in this great industry, which in a few years has risen from a relatively lowly rank among agricultural enterprises to occupy one of the foremost positions.

The Congress, held for the first time in the United States, was sponsored by the poultry industry of this country. In accordance with Congressional authorization the President of the United States issued a cordial invitation to those interested in the poultry industry in the various nations of the world to participate. This invitation was widely accepted.

The success of the Congress is directly attributable to the remarkable degree in which all interested agencies were organized into harmonizing groups with a single purpose—that of insuring a truly representative exposition. Special credit is also due to certain individuals, notably Prof. James E. Rice of Cornell University, one of the founders of the World's Poultry Science Association, present first vice president of the association, and general chairman of the general executive board of the Congress, and W. D. Termohlen, secretary general.

Through campaigns conducted by the various State committees and the Canadian National Committee, well over 100,000 one-dollar affiliated memberships to the Congress were obtained, which with a Federal appropriation of $100,000 went far toward guaranteeing its financial success. In addition, approximately 6,000 full Congress memberships and special Congress memberships admitting to the scientific sessions were sold, an indication of the wide interest in the application of science to the industry. Included in this number were

approximately 225 Congress members from foreign lands and 42 nations. Every State in the United States and Hawaii and Puerto Rico were also represented. Ohio ranked first among the States with over 800 full Congress members, while other States high in this regard were New York, Pennsylvania, Illinois, and Indiana, each having over 300 members.

Official attendance records show that well over 750,000 persons passed through the gates of the exposition. This is truly an amazing record, and probably exceeded the fondest dreams of the sponsors of the Congress. Fortunately, the city of Cleveland, with its spacious public auditorium and extensive exhibit halls, offered excellent facilities.

The great Hall of Industry, with some 225 individual exhibitors, was a representative display, portraying the varied lines of industry associated with poultry production and marketing. The Hall of Nations and States, which contained an imposing array of educational exhibits, represented the combined efforts of 9 U. S. Governmental Departments, 29 States, the insular possessions of the United States, and 9 foreign countries. The material presented in the U. S. Government exhibit was grouped on a subject-matter basis irrespective of the agency concerned. Covering an entire end of the hall, it included sections dealing with breeding, feeding, housing, disease and pest control, marketing, financing, and consumer education, and made a wide appeal throughout the Congress. Attractive and educational exhibits were also presented by Great Britain, Canada, the Province of Quebec, Hungary, Italy, Cuba, the Netherlands, Germany, and Japan. The Hall of Youth featured unique exhibits by college students' poultry science clubs, the 4-H clubs, the Future Farmers of America, the Boy Scouts, and the New Farmers of America.

The Hall of Live Poultry included an exhibit of unusual interest in the International Live Bird Exhibit. This grouping included approximately 750 birds from six foreign countries. The exhibit was noncompetitive and included many unusual types of fowl, some of which had never been shown in this country. The larger portion of this hall was devoted to the competitive live bird show open to breeders from all over the world. This provided an opportunity for visitors to see and study outstanding specimens of the various breeds and varieties of fowl.

High lights of the first day of the Congress were the official opening of the exposition by Henry A. Wallace, Secretary of the U. S. Department of Agriculture and president of the Congress, and welcoming addresses by Harold H. Burton, Mayor of Cleveland, and John W. Bricker, Governor of Ohio. A response by Dr. J. E. Rice,

as general chairman of the Congress, and an address by Karl Vetter of Germany, president of the World's Poultry Science Association, on The World's Poultry Science Association and What It Has Meant to the World's Poultry Industry followed.

The address of Secretary Wallace was entitled The Contribution of the Poultry Industry to World-Wide Abundance. In commenting on the international aspects of the Congress the Secretary stressed the common interests of research workers in the fields of poultry breeding, feeding, and disease control, and at the same time pointed out how complex and varied were the economic problems confronting the poultry industry of the several nations arising from the great diversity of conditions. It was his expressed opinion that an international commodity conference of this nature cannot fail to bring about an increase in mutual understanding of the problems confronting the different nations. In commenting on the rapid progress in poultry technology in recent years, he emphasized the desirability of a well-balanced program between production science and distribution science.

The world-wide application of recent findings in poultry husbandry was further stressed at the general assembly of the second day when the following addresses were presented: Poultry Nutrition and Its Contribution to the Development of the World's Poultry Industry, by Dr. E. Mangold of Germany; Contributions of Genetics to the World's Poultry Industry, by Prof. R. C. Punnett of England; World-Wide Significance of Poultry Diseases and Their Control, by Dr. H. C. L. E. Berger of the Netherlands; and Developments of Marketing and Their Influence on the World's Poultry Industry, by Dr. E. W. Benjamin of the United States.

The scientific sessions of the Congress, aside from one general meeting, were divided into six sections, namely, genetics and physiology, nutrition and incubation, pathology and disease control, economics including marketing, public service and general, and poultry products research. Each of these sections held four or five sessions, with a total of approximately 175 papers scheduled on the collective programs. Relatively large attendance and sustained interest were generally maintained throughout the 5 days of the scientific sessions. About 80 of the papers were contributed by workers from foreign lands, while the remainder were mainly from workers at the various State experiment stations and the U. S. Department of Agriculture. The program as a whole portrayed a cross section of poultry research in progress over the world today. English, French, German, and Spanish constituted the official languages of the Congress. The papers were generally delivered in the language of the authors and are so published in the proceedings, together with

an English summary for those papers printed in a language other than English.

Added features of the Congress were a consumer program, a popular program, a youth program, and a motion picture program. These programs were held daily, concurrently with the scientific sessions, and were well attended throughout the week. The popular program was designed to give recognition to all of the most important phases of poultry husbandry and marketing, with attention directed to the small-flock owner as well as the commercial operator. Under this plan, lectures on popular subjects were delivered during the morning sessions, while the afternoon meetings were divided into smaller conference groups, including sections on feeding and management, breeding, marketing, and diseases. Approximately 100 persons of national and international reputation participated in making these programs highly successful.

The value of the Congress was further enhanced by the meetings of numerous societies and organizations associated with the poultry industry. These included the Poultry Science Association of North America, the American Poultry Association, the International Baby Chick Association, and the American Veterinary Medical Association.

The World's Poultry Science Association, organized in 1912, is the fathering body of the World's Poultry Congress, which has been held regularly at 3-yr. intervals since 1921. The association is an active and continuing organization, encouraging scientific research and investigation among its members. Announcement was made of the election of Prof. J. E. Rice as its president to succeed Karl Vetter of Germany. The new vice presidents include Dr. S. Castello of Spain, J. J. Jordaan of South Africa, Dr. Karl Beller of Germany, Percy Francis of England, C. S. T. van Gink of the Netherlands, Dr. Charles Voitellier of France, and Dr. R. B. Thompson of the United States. Reelected secretary-treasurer of the association was Dr. G. F. Heuser of Cornell University. Dr. B. J. C. te Hennepe of the Netherlands was reelected secretary for continental Europe.

The many individuals who labored so diligently in perfecting plans for the Seventh World's Poultry Congress may be justly proud of their accomplishments. It has undoubtedly made an important and lasting contribution to the progress of this great branch of agriculture and has set a very high standard for similar gatherings in the future.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Biochemical investigations at the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 421 (1939), pp. 17, 18*).—Investigations here noted include tobacco leaf, rhubarb leaf, beet pigment, and protein studies.

[Chemical investigations at the Kentucky Station] (*Kentucky Sta. Rpt. 1938, pt. 1, pp. 19, 20*).—This report notes a colorimetric method for determination of carbon in soil, a modification of the chlorate method to include amide and ammonia nitrogen, and data as to the fluorine content of natural waters, soils, plants, and animals.

[Chemical and bacteriological investigations of the Massachusetts Station] (*Massachusetts Sta. Bul. 355 (1939), pp. 25, 26, 33, 34*).—Bacteriological studies on salt tolerance of fecal bacteria, by J. E. Fuller and R. H. Gulberson; a study of the Eijkman test and streptococci in swimming pool water, both by R. L. France; and chemical investigations on the iron, copper, manganese, and iodine content of fruits and vegetables, by E. B. Holland, C. P. Jones, and W. S. Ritchie, are noted.

[Industrial chemical investigations by the Puerto Rico College Station] (*Puerto Rico Col. Sta. Rpt. 1938, pp. 26–32, 89, 91*).—These are briefly reported upon under the following captions: Jamaica type rum produced in Puerto Rico, by R. Arroyo and M. Manzano; alpha cellulose, an important byproduct from sugarcane, by Arroyo; the mango, its industrial possibilities, chemical and physical characters, and poisonous cassava, both by H. Cruz Monclova; the cassava—study of the cassava root—investigations on the preparation of cassava flour to be used as a substitute of wheat flour in bread making; and the extraction of papaya juice and papain.

Electrokinetics.—XX, Interfacial energy and the molecular structure of organic compounds.—VI, The electric moment of aliphatic alcohols, acids, and esters at cellulose and aluminum oxide interfaces, M. A. Lauffer and R. A. Gortner. (Minn. Expt. Sta.). (*Jour. Phys. Chem., 42 (1938), No. 5, pp. 641–656, figs. 8; abs. in Minnesota Sta. Rpt. 1938, pp. 38, 39*).—A new cell provided with ground glass joints and designed for use in the streaming potential method greatly improved the ease with which measurements similar to those previously noted (E. S. R., 80, p. 149) could be made. In order to obviate the difficulties encountered in dealing with diaphragms of extremely high resistance and with the measurement of streaming potentials of excessively large magnitude, the electrodes of such diaphragms were shunted through an 11-megohm resistor, thus adding a new technic to electrokinetic methods. Detailed observations are recorded.

A simplified technic for the determination of contact angles and its application to studies on wetting, E. Kneen and W. W. Benton. (Minn. Expt. Sta.). (*Jour. Phys. Chem., 41 (1937), No. 9, pp. 1195–1203, figs. 2*).—The apparatus consisted essentially of an arc lamp, a condensing lens system, an

adjustable stage, and either a picture frame holding a thin sheet of paper or a ground glass. The plane surface being studied was mounted on the adjustable stage and brought into the focus of the condensing lens. The liquid to be tested was then placed on the plane surface, and its image was thus projected onto the screen. Contact angles of a variety of substances were tested and found to agree satisfactorily with the published data.

For a series of sodium salts of the fatty acids the contact angle against paraffin was found to change only slightly up to sodium caprylate. Here the contact angle was approximately 110° (water 115°). From sodium caprylate to sodium palmitate the change in contact angle was pronounced, was essentially linear, and approximated 0° at sodium palmitate. Stearic acid and cholesterol both could be obtained with "polar" and "nonpolar" surfaces.

The method is applicable to the study of the wetting capacity of leaf surfaces and of tooth surfaces and offers promise of yielding valuable information on wetting by water, insecticides, or cleansing agents.

Modern cereal chemistry, D. W. KENT-JONES (*Liverpool: Northern Pub. Co., Ltd., 1939, 3. ed., pp. VII+720, figs. 74*).—It has been the author's purpose "to give the reader a general survey of the application of science to the study of wheat, flour, and, indeed, to some extent to cereals other than wheat." The book is directed especially to the milling and baking industries. The contents are: Composition of wheat, flour, etc.; principal world wheats; cereals other than wheat; colloidal chemistry and hydrogen-ion concentration; flour strength; the technic and the chemistry of the baking process; conditioning and the effect of heat on wheat and flour; composition of mill products; bleaching and flour improvers; dough testing machines; flour for purposes other than bread making; nutritive value of bread; cereal and balanced rations for livestock; the microbiology of cereals; moisture in wheats and cereal products; and methods of analysis.

Peptization of soybean proteins, A. K. SMITH and S. J. CIRCLE. (U. S. D. A. and 12 expt. stas.). (*Indus. and Engin. Chem., 30 (1938), No. 12, pp. 1414–1418, figs. 4*).—The amount of nitrogenous matter extracted from oil-free soybean meal by hydrochloric, trichloroacetic, oxalic, sulfuric, and phosphoric acids, and by sodium and calcium hydroxides was determined over a wide range of pH values, and is compared with similar dispersion data for wheat, tepary beans, and Alaska peas.

Microscopy of starch by the Spierer lens, S. WOODRUFF. (Univ. Minn. and Univ. Ill.). (*Indus. and Engin. Chem., 30 (1938), No. 12, pp. 1409–1413, figs. 20*).—The Spierer objective × 90 was found to reveal some details in the structure of the starch grain which the author saw less clearly when using the ordinary × 92 objective, each being used with a ×12.5 eye piece. Photomicrographs are reproduced with the paper.

Fats and oils, lipoids, waxes, resins, ethereal oils, edited by E. BAMES ET AL. (*Fette und Öle, Lipoide, Wachse, Harze, ätherische Öle. In Handbuch der Lebensmittelchemie. Berlin: Julius Springer, 1939, vol. 4, pp. XXI+966, figs. 247*).—This volume deals with general analytical methods for food fats; preparation of fats and fat constituents; occurrence, production, and properties of the food fats; microscopical analysis of oil-yielding seeds and fruits; the lipoids; the waxes, resins, ethereal oils, and fruit esters; and the German and non-German legislation concerning fat products.

Chemical constitution of the oils from superior and inferior flaxseeds, R. A. GROSS and C. H. BAILEY. (Minn. Expt. Sta.). (*Oil & Soap, 14 (1937), No. 10, pp. 260–263*).—All seed oils of the Bison flax variety contained a higher percentage of oleic acids and a lower percentage of linolenic acids than the Abyssanian Yellow flax variety. The iodine number appears to be a varietal

characteristic, and the oils have a degree of unsaturation which can be varied by growing the flax under different environmental conditions.

Fruit jellies.—X, The rôle of pectin.—6, Viscosity of dilute pectin solutions as affected by metallic salts and pH, G. L. BAKER and M. W. GOODWIN (*Delaware Sta. Bul. 216 (1939), pp. 40, figs. 7*).—In this continuation of the station's work on pectins (E. S. R., 77, p. 4), it was found that pectin solutions, upon dilution without regard to H-ion concentration, gave viscosity values which agree neither with the relation of Einstein (η_{sp}/C) nor with that of Arrhenius ($\log \eta_r/c$). Upon dilution with adjustment of H-ion concentration to pH 2.6, such solutions gave viscosity values which agree very closely with the logarithmic relationship of Arrhenius ($\log \eta_r/c$). A correctional factor 0.2 in the formula of Arrhenius ($(\log \eta_r - 0.2)/c$) gave improved constants at concentrations of pectin sufficiently high to produce relative viscosities above 4. Maximum viscosities of dilute solutions of the low-ash pectin were obtained at pH 5.5 Either an increase or decrease of the H-ion concentration from this point caused a decrease in solution viscosity. Above pH 7.0, a decrease in viscosity with increase in alkalinity indicated depolymerization and decomposition of the pectin. Decrease in viscosity with increase in acidity was proportionately less as the concentration of pectin in solution was raised. Indications that specific viscosities vary directly with concentrations of pectin in solution at pH values above 5, $\eta_{sp}/c = k$, were observed.

Low concentrations of salt added to 0.125 percent pectin solutions did not affect solution viscosity below pH 2.75. Above pH 2.75, abnormally high viscosities in the pectin solutions resulted from the formation of complex hydroxides with the salts of copper, lead, ferric iron, and aluminum at H-ion concentrations at which the metallic ion is normally precipitated. Higher concentrations of the salt increased viscosity but in a narrower pH range. Above pH 2.75, the normal viscosity of the pectin solution was lowered by small quantities of those salts whose hydroxides are not precipitated in the pH range 3 to 7. Above pH 7 viscosities were less affected. Salts with dehydrating properties had the greatest tendency to lower viscosity. Results indicate that small quantities of metals present as contaminants in pectin solutions will cause abnormal changes in viscosity in certain pH ranges, but below pH 2.75 the effect will be negligible. Viscosity of dilute pectin solutions could be correlated with jelly grade below pH 2.75. There were indications that otherwise unexplained shifts from high to low viscosity : jelly grade ratios and vice versa are due to the presence of salts and lack of pH control.

The plant alkaloids, T. A. HENRY (*London: J. & A. Churchill, 1939, 3. ed., pp. VIII+689*).—Accumulation of information since the publication of the second edition (E. S. R., 52, p. 309) has necessitated rewriting of the entire book and much enlargement. The alkaloids are dealt with mainly according to a chemical classification, but the grouping according to botanical relationships of the plants in which the bases are found has been followed within the larger chemical groups.

A flexible gas thermoregulator, A. J. BAILEY. (Minn. Expt. Sta.). (*Science, 86 (1937), No. 2240, pp. 525, 526, fig. 1; abs. in Minnesota Sta. Rpt. 1938, pp. 25, 26*).—The device described may be made from a glass vessel of any shape for normal conditions of about 250-cc. capacity. The single outlet from this vessel consists of a tube rising vertically, then making a complete loop with the open end again rising vertically. In the lower part of this glass loop, a small amount of mercury is trapped. On the surface of this mercury, a tapered glass rod is floated. In the open end of the outlet tube, the proper adjustments and side tubes are provided for the outlet and inlet of the gas, the valve seat,

the bypass, and the temperature adjustment, combined in two pieces of glass. In operation, expansion of the gas in the bulb unit displaces the mercury in the loop, and in turn the glass floating on the mercury pushes against the valve seat and shuts off the gas supply to the burner. In operation, the temperature could be controlled accurately within a plus or minus 0.1° C.

An inexpensive microchemical filter crucible, A. J. BAILEY. (Minn. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 9 (1937), No. 10, pp. 490, 491, fig. 1*).—Finding conventional microchemical filter crucibles either unsuitable or expensive, the author designed a crucible made from Pyrex tubing by molding in the flame to an orifice of roughly conical shape. A small unattached drop of Pyrex glass was used in this orifice as a plug. The final preparation of the crucible consisted of forming the conventional asbestos mat as with Gooch crucibles. The new type of crucible showed practically no loss of weight on ignition and was convenient for manipulations necessary to accuracy.

Laboratory columns packed with silicon carbide, H. J. HALL and G. B. BACHMAN. (Ohio State Univ.). (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 9, pp. 548, 549*).—The authors found that ordinary lump silicon carbide is not only cheap and chemically inert, but may be classed with the most efficient column packings now in use. No special care is required in handling, and a fouled packing can be cleaned with boiling acid cleaning solutions if necessary. Since distillations may be made with equal impunity using organic bases, corrosive sulfur compounds, or unstable halides, silicon carbide-packed columns are particularly recommended for general laboratory use.

The determination of the thermal conductivity of gases, C. M. MASON and R. M. DOE. (Univ. N. H.). (*Jour. Chem. Ed., 14 (1937), No. 4, pp. 182-184, figs. 2*).—The authors have modified a familiar method, rendering it useful for use in the elementary physical chemistry laboratory. Directions for the construction and use of a simple thermal conductivity cell are given. The necessary calculations are indicated, and some results are stated.

Some critical studies of the phenoldisulfonic acid method for the determination of nitrates, E. M. ROLLER and N. MCKAIG, JR. (U. S. D. A. and S. C. Expt. Sta.). (*Soil Sci., 47 (1939), No. 5, pp. 397–407*).—Clarification of the extract was accomplished most satisfactorily with calcium sulfate solution. The addition of calcium carbonate to the extract before evaporation prevented a loss of nitrates due to acidity and was the most satisfactory basic material tried. Ammonium hydroxide caused a loss of nitrates. The most satisfactory sample : water ratio was 1:2 by weight. The best time of contact of sample with water was 5 min. Concentrated hydrogen peroxide was the most effective decolorizing agent. Commercial superoxol was found generally to contain nitrates and was purified by vacuum distillation. When hydrogen peroxide was heated with common bases, peroxides were formed. These reacted with phenoldisulfonic acid, producing a pink-to-brown color upon neutralization of the solution with ammonium hydroxide. The color was prevented by decomposing the peroxides of the residue with carbonated water and evaporating to dryness to expel all H_2O_2 vapor before adding phenoldisulfonic acid. Spontaneous ignition of the residue, which is likely to occur when the extract is evaporated to dryness with hydrogen peroxide, and discoloration of the solution were prevented by the carbonated water treatment. Calcium carbonate was the only basic substance tested which produced a white residue and did not form a peroxide. Concentrated hydrogen peroxide oxidized ammonium hydroxide to nitrate but did not appreciably oxidize the nitrogen in several types of nitrogenous organic compounds.

A modified procedure, based on these observations, is detailed.

Comparison of methods of determining small quantities of HCN, O. H. Coleman and R. Gardner. (Colo. Expt. Sta.). (*Soil Sci., 47 (1939), No. 5, pp. 409–413*).—Of the methods studied, the modified alkaline method (E. S. R., 78, p. 446) of determining small quantities of HCN gave the most reliable results. The tin condenser is satisfactory for distillations of solutions of HCN. Autolysis in an Erlenmeyer with the resultant transfer of plant material to the distilling flask causes no apparent loss in HCN if the transfer is made with a reasonable amount of care. Good results were obtained by the modified alkaline method by titrating the entire distillate instead of an aliquot.

The detection, identification, and gravimetric determination of pentosans and pentoses, A. J. Bailey. (Minn. Expt. Sta.). (*Mikrochim. Acta, 2 (1937), pp. 35–46*).—The utilization for identification of crystal habits, optical properties, and physical constants of sugars and their derivatives is suggested. A procedure for crystal identification by optical means is outlined. The methods of sugar estimation applicable to pentoses are discussed, and the errors of the standard pentosan determination are pointed out. An accurate gravimetric macrodetermination of pentoses was developed and reduced to a microbasis. This requires only equipment available in the laboratory, and high accuracy and precision were obtained on 3-mg. samples of wood and from 0.5- to 1-mg. samples of pentose materials.

Determination of moisture in wood chips, sawdust, and pulp, A. J. Bailey. (Minn. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 9 (1937), No. 12, pp. 568, 569, fig. 1; abs. in Minnesota Sta. Rpt. 1938, p. 26*).—The author substitutes tetrachloroethylene for toluene in the Bidwell-Sterling distillation method (E. S. R., 53, p. 805), thereby avoiding fire risk, causing the sample to float so that it is protected from overheating, and providing an easily read meniscus. The trap was modified so that the heavier tetrachloroethylene could be drained at will from underneath the water back to the flask.

The calcium-phosphorus ratio of the skins of canning peas and its relation to maturity, D. W. Bolin and W. Schroeder. (Idaho Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 8, pp. 631–636*).—The authors present data which show a marked variation in the calcium and phosphorus content of the pea skin with the stage of maturity. Analyses of the skins showed that the calcium content and the calcium-phosphorus ratio increase, and the phosphorus content decreases, with approach toward maturity.

Manufacture of sweet potato starch in the United States, H. S. Paine, F. H. Thurber, R. T. Balch, and W. R. Richee. (U. S. D. A.). (*Indus. and Engin. Chem., 30 (1938), No. 12, pp. 1331–1348, figs. 18*).—The chemical research and engineering involved in the erection and operation of a factory for production of starch from sweetpotatoes are described. The properties of sweetpotato starch were studied and evaluated from standpoint of use in various industries. The value of the byproduct pulp as cattle feed was established. A new method of dehydration was evolved, making possible the storage of sweetpotatoes and year-round operation of starch factories.

The cooking process: Butanol cooking of hardwoods and softwoods, J. M. McMillen, R. A. Gortner, H. Schmitz, and A. J. Bailey. (Minn. Expt. Sta.). (*Indus. and Engin. Chem., 30 (1938), No. 12, pp. 1407–1409*).—The authors pulped six hardwoods and six softwoods with a mixture of equal volumes of water and normal butanol. They found that the hardwoods were all pulped satisfactorily, but the softwoods were only partially pulped. The softwoods have a much greater proportion of lignin resistant to butanol delignification than do the hardwoods. Birch and basswood are more efficiently delignified, and balsam is less efficiently delignified than other woods in their

respective classes. Aspen cellulose is recovered in higher yields than is the case with other hardwoods. All of the hardwoods yield pulps which, insofar as the analyses are concerned, would be commercially satisfactory. None of the softwoods yielded pulps with analyses which would be satisfactory commercially.

The cooking process.—X, Pulping wood with alcoholic nitric acid solutions, S. I. Aronovsky and R. A. Gortner. (Minn. Expt. Sta.). (*Indus. and Engin. Chem., 29 (1937), No. 12, pp. 1431–1434, figs. 4*).—In continuation of previous work (E. S. R., 77, p. 154), aspen and jack pine sawdust and chips were refluxed with aqueous and alcoholic (ethyl and *n*-butyl) solutions of nitric acid, and the acid-treated wood was boiled with dilute sodium hydroxide solutions. The concentrations of the acid and alkali as well as the duration of the treatment were varied. Cooks were also run with mixtures of aqueous and alcoholic nitric acid and with alcoholic solutions of sulfur dioxide and lithium bisulfite. The alcoholic nitric acid solutions gave much higher yields of good pulp than were obtained with the aqueous acid under similar conditions. Increasing the concentration of the acid resulted in lower total yields but gave larger yields of screened pulp. Dilution of the alcoholic solutions with water had little effect on the yields of pulp. Jack pine did not pulp as readily as aspen. Soda ash was not as efficient as sodium hydroxide in removing the compounds formed by the action of nitric acid on wood.

Adhesive properties of lignin and cellulose, A. J. Bailey. (Minn. Expt. Sta.). (*Paper Indus., 19 (1938), pp. 1274–1276*).—Removal of cellulose from thin sections of dense fiberboards destroyed the structure, while removal of lignin effected little change. Thin sections of paper containing high and low lignin contents behaved similarly, as did also sheets of the same paper. Fiberboards were prepared from purified pulp by pressing at room temperature and had properties similar to the commercial product containing lignin. The relation of these findings to industrial processing is pointed out, and changes, such as beating and chemical gelatinization, are recommended to increase strength.

Four new products made from lignin in wood waste (*Jour. Forestry, 37 (1939), No. 6, p. 494*).—Notice is given of the successful preparation of four byproducts obtained from lignin by treatment of the material under heat and pressure in the presence of H and a catalytic agent.

Research for new uses for farm commodities, T. H. Hopper (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 5, pp. 20–22, fig. 1*).—This is an outline of the nature, organization, and projected work of the regional research laboratories (E. S. R., 80, p. 289).

AGRICULTURAL METEOROLOGY

Meteorology and agriculture, C. F. Sarle. (U. S. D. A.). (*Bul. Amer. Met. Soc., 20 (1939), No. 4, pp. 154–160*).—In this address are discussions of investigations of long-range weather and crop forecasting, of the relationships of weather to growth and production of crops, and of agro-meteorology, with 14 literature references.

Recent trends in weather service, W. R. Gregg. (U. S. D. A.). (*Bul. Amer. Met. Soc., 20 (1939), No. 4, pp. 165–169*).—A brief review.

Progress in applying new synoptic aids to day-to-day forecasting, R. H. Weightman. (U. S. D. A.). (*Bul. Amer. Met. Soc., 20 (1939), No. 4, pp. 169–177, figs. 6*).—A brief summary of recent advances.

Hydro-meteorological aspects of flood control and forecasting problems, M. Bernard. (U. S. D. A.). (*Bul. Amer. Met. Soc., 20 (1939), No. 4, pp. 160–*

Indiana regional contrasts in rainfall intensity and some apparent effects thereof, S. S. VISHER (*Ind. Acad. Sci. Proc., 53 (1937), pp. 147, 148*).—An abstract.

Rainfall and run-off of New England, A. T. SAFFORD (*Jour. Boston Soc. Civ. Engin., 26 (1939), No. 2, Sect. 2, pp. 101, figs. 23*).—This monograph is the result of an effort by the author to restudy the data on rainfall and run-off of New England and bring up to date the report[1] made in 1921. The figures obtained for the subsequent 15 yr. have been added to that material and the conclusions of the former report tested out from the old and new material and strengthened or questioned, and certain new conclusions drawn which are offered for discussion. The topics discussed are drought conditions in the United States, precipitation in the United States and on the Pacific Coast, calendar v. climatic years, precipitation—New England (including Weather Bureau and private records, 11 selected stations, comparison of records, average precipitation, dry periods and deficiencies, wet periods and excesses, dry and wet continuous 10-yr. periods, dry and wet cycles, and good and poor water power years), run-off (including New England run-off figures, New England streams by years chronologically and in order of dryness, run-off v. drainage area, Connecticut River tributaries—west v. east sides, good and poor water power years, and streams with large v. those with small storage), duration curves, evaporation, snow cover, effect of reforestation, and ratings.

A study of a century and more of precipitation records for 11 stations and a half century for many more appears to indicate that there is not much difference in the amount when averages for 10 or more years are compared. If there are cycles depending on conditions not now well known, it is believed that it will be many years before this can be demonstrated.

Dew-point hygrometer for use at low temperatures, C. A. WINKLER (*Canad. Jour. Res., 17 (1939), No. 2, Sect. D, pp. 35–38, fig. 1*).—An apparatus is described providing for slow cooling of a metal mirror by circulating over it liquid from a vessel in a thermoregulated bath and the use of multiple thermocouple elements contained in the mirror, the set-up enabling dew-point temperatures to be approached gradually and to be accurately determined. Precise measurements of relative humidity at low temperatures, with the moisture content of the air low, therefore become possible. The author reports a precision of ±0.5 percent relative humidity as readily attainable down to −15° C.

Comparative evaporation rates in normal forest, open park, and cleared areas, J. D. WILSON and R. R. PATON (*Ohio Sta. Bimo. Bul. 198 (1939), pp. 64–69*).—Black and white atmometers were run for 4 yr. in a cleared area of uninterrupted air movement and sunshine, an open park in which there were scattered large trees but no undergrowth, and a normal forest which usually consisted of a stand of second growth trees of medium density in which there was the average amount of undergrowth. Use of the two types of atmometers made it possible to determine the influence of the light factor on evaporation independently of the other factors. In an average of the data from four stations, the radiant energy (B–W) which penetrated to the 4-ft. level in a normal forest and in a parklike area was only 10.5 and 41 percent, respectively, of that in the open, over a 16-week period from ± June 1 to September 20. B–W values made up 29.6, 18.8, and 9.1 percent of the total loss from the black atmometer in the cleared, open park, and normal forest areas, respectively. White atmometers, which may be assumed to measure the evaporation due to all factors other than sunshine, lost 77 and 46 percent as much water in the open park and normal forest areas, respectively,

[1] Jour. Boston Soc. Civ. Engin., 9 (1922), No. 8, pp. 157–212, pls. 6, figs. 10.

as in the cleared, or open, areas. The first value given represents the average of two stations and the latter an average of four.

A volumetric apparatus for measuring dew [trans. title], H. Mrose (*Ztschr. Angew. Met., Wetter, 56 (1939), No. 5, pp. 137–149, figs. 3*).—The author discusses the difficulty of measuring dew, reviews the earlier methods, describes and illustrates the apparatus here presented, and discusses the source of dew and the value of measuring it. There are nine references.

The droughts of 1930, 1934, and 1936 in the Corn Belt and associated areas, J. E. Switzer (*Ind. Acad. Sci. Proc., 53 (1937), pp. 149–161, figs. 2*).—These three droughts were widespread in the central part of the United States, but decreased in intensity and destructive effects towards the north and the south. The year 1930 was relatively moist in the western Great Plains area. In general, each drought was more devastating than the preceding one, and new high temperature records were established in most of the States. The intensity of the droughts was, in general, proportional to the extremes of high temperature and their duration. Excessive evaporation was as important a factor in the crop deterioration as was the deficiency in precipitation.

Duststorms and dust walls [trans. title], H. Koschmieder (*Naturwissenschaften, 27 (1939), No. 8, pp. 113–122, figs. 8*).—The author defines the terms, presents (with copious classified bibliography) the geographic distribution of duststorms, summarizes data on duststorms in the United States, the Sudan, the Sahara, Syria, Palestine, Mesopotamia, Iran, and Australia, and finally discusses warm and cold air duststorms and dust walls in general.

The agricultural significance of snow [trans. title], J. Blüthgen (*Ztschr. Angew. Met., Wetter, 56 (1939), No. 4, pp. 111–122, figs. 8*).—A general discussion of the agricultural relationships in the broad sense.

SOILS—FERTILIZERS

An introduction to soil science, B. Isgur (*Boston: Agr. Sci. Pub. Co., [1938], pp. XI+[3]+239, figs. 47*).—"There are so many details included in most texts that the average student fails to gather the fundamentals. With this fact in mind, the author has attempted to set forth the fundamentals of soil science and has left with the instructor the filling in of whatever detail and illustration he may deem necessary."

The contents are a foreword; chapters 1 to 16, having the titles historical, some elements of chemistry, the origin of the earth, the rock-soil cycle, soil formations, soil separates and soil classification, soil texture and soil structure, tillage and tillage implements, soil surveys, plant nutrition and composition, organic matter and micro-organisms, soil acidity and lime, soil moisture, drainage and drainage systems, crop rotations, and fertilizers, respectively; soil diagnosis and soil diagnosis key; exercises; and a general index. The chapter on tillage and tillage implements is by C. H. Thayer (Mass. State Col.).

[Soil investigations by the New Haven Station]. (Partly coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul. 421 (1939), pp. 41–43*).—These have included pasture soil studies and studies on soil management for vegetable crops, losses from the soil by leaching, and soil treatments in the forest nursery.

[Soil and fertilizer work at the Kentucky Station] (*Kentucky Sta. Rpt. 1938, pt. 1, pp. 20, 21, 37, 38, 39, 54, 55*).—This report discusses work on boron and other minor elements and soil fertility, field tests of phosphates, the effect of certain cropping treatments on the amount of nitrogen removed by cropping and drainage from lysimeters, greenhouse tests of availability of phosphates, the effect of phosphorus fertilization on the chemical properties of soils,

and lime and fertilizer experiments on eroded soil and soil of sandstone origin.

[Soil investigations of the Massachusetts Station] (*Massachusetts Sta. Bul. 355 (1939), pp. 12–14, 14, 15, 19, 20, 34, pl. 1*).—This report contains notes on rates of decomposition of various sawdusts, shavings, cacao hulls, and peanut hulls by J. Zak and W. S. Eisenmenger; the use of nitrogen as an aid in decomposing old sod, by K. J. Kucinski, W. H. Bender, and Eisenmenger; the absorption by lettuce and cabbage plants of chemical elements important in human nutrition and magnesium requirements of plants, both by Eisenmenger and Kucinski; relationships of natural vegetation to physicochemical properties of soils in Massachusetts, by W. S. Colvin and Eisenmenger; soil erosion in Massachusetts, by Kucinski and Eisenmenger; effect on pH from adding sulfur to a soil, by R. W. Donaldson, W. G. Colby, and H. M. Yegian; the comparative nutritive effects of copper, zinc, chromium, and molybdenum, by H. R. DeRose, Eisenmenger, and W. S. Ritchie; and lignin and its relation to the absorption of minerals by plants, by E. Bennett.

[Soil investigations of the Wisconsin Station] (*Wisconsin Sta. Bul. 443 (1939), pp. 53–56, fig. 1*).—This report contains brief notes on soil boron determination by means of the quinalizarin color reaction, by K. C. Berger and E. Truog; fertilizer value of activated sludge, by C. J. Rehling and Truog; and management of very shallow soils, by A. R. Albert.

[Soil Survey Reports, 1932 and 1936 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1932, No. 35, pp. 40, figs. 2, map 1; 1936, No. 1, pp. 67, pls. 2, figs. 3, map 1*).—These surveys were made in cooperation with the respective State experiment stations: 1932, No. 35, Armstrong County, Pa., R. T. A. Burke et al.; and 1936, No. 1, Mason County, Mich., C. H. Wonser et al.

Preservation of small core soil samples, R. W. Gerdel (U. S. D. A.). (*Soil Sci., 47 (1939), No. 5, pp. 353–355, pl. 1*).—*A method for preserving small core soil samples by impregnation with an unpolymerized plastic (commercially available) and subsequent polymerization has given very satisfactory results. This method of preservation permits frequent handling of the sample without disintegration of the structure, and a suitably collected and preserved series of samples permits direct comparison of structural changes throughout the season.* The preserved samples retain almost all of the structural features which are observed in the fresh field samples, and in some soils these structural differences are greatly emphasized by this process of preservation. Since the plastic used is slightly water soluble in the unpolymerized state, it is miscible with the soil solution and apparently does not produce serious structural changes. Ground and polished faces of six cores so preserved are shown in a photograph.

Chemical characteristics of the soils of the rice area of Louisiana, J. F. Reed and M. B. Sturgis (*Louisiana Sta. Bul. 307 (1939), pp. 31, figs. 6*).—The soils of the Iberia and Lake Charles series show many resemblances. The theory of a common alluvial origin appears to be well founded. The two series might be united. The Calcasieu and Katy series developed on older terraces are very similar and should be united.

Flooding a virgin Crowley soil with distilled water caused increases in the pH and in the contents of soluble sodium and magnesium. Flooding also caused increases in the contents of iron and silica in the displaced solution. It was found that continual flooding and cropping to rice over a period of years breaks down to a measurable extent the water-stable aggregates of the soil and causes deflocculation. Improvement in the physical condition of a cultivated Crowley soil by various treatments was detected by measurements of the rate of percolation of water through the soil and by aggregate analysis. Leguminous organic

matter was the most effective treatment for physical improvement. Applications of gypsum, lime, and elemental sulfur were much less effective.

Soil macrostructure as affected by cultural treatments, R. C. Cole (*Hilgardia [California Sta.], 12 (1939), No. 6, pp. 427–472, figs. 26*).—The author elaborated a method for measuring quantitatively changes in the size distribution of aggregates and the volume weight of the soil and found that, in general, plowing caused a decrease in cloddiness and volume weight unless performed at excessive moisture contents. Harrowing usually broke up some clods. Disk and spring-tooth harrows seemed more effective than spike-tooth harrows in reducing cloddiness. Rolling and leveling increased the volume weight and had a pulverizing effect on the very dry soils, but moderately moist soils usually showed increased cloddiness after these operations. The cloddiness of soils worked up to a fine, highly pulverized condition was greatly increased by irrigation, often to a point far in excess of that before any tillage. Tilled areas that were left cloddy showed some increase in cloddiness, but not so much as those that had been thoroughly pulverized. Winter rains appeared often to have as great an influence on the size distribution of aggregates as the tillage operations or irrigations.

Capillary tension as a measure of the pore space unoccupied by water in some dense orchard subsoils, D. Boynton. (Cornell Univ.). (*Soil Sci., 47 (1939), No. 5, pp. 347–352, figs. 2*).—On the basis of this study, it is concluded that the tensiometer can be used with caution to estimate the pore space unoccupied by water in certain dense orchard subsoils. Because of variations in soil texture and structure, the calibrations apply, however, only to apparently uniform layers in restricted areas and even then are subject to the possibility of error. Although the range of pore space covered by the tensiometer is small, it seems possible that the most critical range is covered insofar as the aeration of these soils is concerned.

Some factors influencing the heat of wetting of soils, H. A. Wadsworth. (Hawaii Expt. Sta.). (*Soil Sci., 47 (1939), No. 5, pp. 385–390*).—A critical study of the behavior of two soils in determinations of their heat of wetting showed that the results of determinations of heats of wetting are of qualitative interest only unless unusual precautions are taken. The conventional cooling of oven-dried samples in ordinary desiccators may permit the adsorption of enough water prior to the determination of the heat of wetting to reduce materially the value of the result. The heat of wetting of a sample of soil at a specified moisture content appears to be a function of the temperature at which the determination is made. Increases of temperature at the time of determination result in decreases in the heat of wetting, and conversely.

Subsoil moisture under semiarid conditions, J. S. Cole and O. R. Mathews. (Coop. Mont., N. Dak., Nebr., and Kans. Expt. Stas.). (*U. S. Dept. Agr., Tech. Bul. 637 (1939), pp. 71, figs. 14*).—The authors find that within the zone of normal wheat-root development the soil of semiarid regions is usually dry at harvest time. If loss through weeds is prevented, however, accumulation takes place from harvest until the spring crop reaches the stage of a transpiration rate exceeding the rate of moisture supply by precipitation. "As a general rule, the entire annual cycle of charge and discharge is confined to only a portion of the zone where roots can develop freely, and no water reaches the underlying subsoil. In a few exceptional years at a few stations the entire root zone fills with water and a small quantity penetrates beyond the reach of wheat roots.

"The addition of fallow to the cropping system lengthens the period of water accumulation by a year, permits the wetting of the entire root zone in more cases than under continuous cropping, and increases the number of times when water reaches the underlying subsoil.

"Water charge and discharge are much the same under sod as under continuous grain production, although available water is removed completely to a lower depth under sod than under grain, probably because of the presence of deep-rooted perennial plants in native sod. The time element limits the depth to which the roots of annual crops can remove all the available water."

The subsoil was found to be generally less dry under continuous grain production than under sod. "The net result of the production of annual crops in the semiarid section has been an increase rather than a decrease in subsoil water."

A permanent loss to New England: Soil erosion resulting from the hurricane, H. H. BENNETT. (U. S. D. A.). (*Geog. Rev., 29 (1939), No. 2, pp. 196–204, figs. 14*).—The author considers that erosion damage to productive soils may equal the total of all other storm damage. Where protective measures were in use damage was much less or was prevented entirely.

Erosion and related land use conditions on the Scantic River watershed, Connecticut-Massachusetts, P. H. MONTGOMERY (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, pp. 27, pls. 21, fig. 1*).—The Scantic River rises about 12 miles southeast of Springfield, Mass., and flows southwest to the Connecticut River about 7 miles north of Hartford, Conn. The watershed comprises about 71,129 acres.

Of the entire watershed, 8.2 percent showed no apparent erosion, 66.7 showed slight erosion, 20.6 moderate, 1 severe, and 0.1 percent very severe. The corresponding figures for cropland are 0.1, 65, 31.2, 0.7, and 0 percent. Like data were obtained from idle land, pasture, and woodland. Control measures are discussed, and a description of soil types is appended.

Soil and alkali problems. (Coop. U. S. D. A. et al.). (*Wyoming Sta. Rpt. 1938, pp. 8, 9*).—A year's record of the movement of total salts and of nitrates in the waters of the Big Horn River is noted.

Effect of dilution on the water-soluble and exchangeable bases of alkali soils and its bearing on the salt tolerance of plants, W. P. KELLEY. (Univ. Calif.). (*Soil Sci., 47 (1939), No. 5, pp. 367–375*).—"The total amount of Na that is removed from an alkali soil by displacement procedure may be a few milliequivalents per 100 gm. less than that removed by 1:5 water extraction. This does not justify the conclusion that the exchangeable Na, as ordinarily determined, is seriously in error. The factors which influence the determination of exchangeable Na in alkali soils are so varied and numerous that a high degree of precision of method will probably serve no useful purpose. Dilution appears to affect to less extent the determination of water-soluble Ca and Mg than that of Na. Among the common anions of alkali soils, the total amounts of HCO_3 and SO_4 found are likely to be the most markedly affected by dilution, whereas Cl was scarcely affected in the soils investigated. The same was probably also true of NO_3."

It is pointed out that the solution displaced from an alkali soil differs substantially from the solution at the growing root-soil particle contact. The bearing of the data obtained on salt tolerance studies is briefly discussed.

The determination of the organic base-exchange capacity of soils, L. C. OLSON and R. H. BRAY. (Ill. Expt. Sta.). (*Soil Sci., 45 (1938), No. 6, pp. 483–496*).—In the Illinois soils studied, the organic matter ranged from approximately 13,500 to 165,000 lb. per acre, and the organic base-exchange capacity varied from 0.6 to 16.3 milligram equivalents, constituting from 6.8 to 43.4 percent of the total base-exchange capacity of the soils. The end point in the destruction of the organic base-exchange capacity was reached by using a single 40-cc. treatment with 15 percent H_2O_2. In the sample of peat studied, one treatment with 40 cc. of 22.5 percent H_2O_2 was necessary to reach the end point

in the destruction of the organic base-exchange capacity. Manganese dioxide interfered in acid, neutral, and alkaline suspensions. Manganous salts interfered in alkaline media. Calcium carbonate also made the complete destruction of organic base-exchange capacity difficult. "It is recommended that, in studying soils similar in nature to the soils included in the present work (the peat excepted), one treatment with 40 cc. of 15 percent peroxide be used in the method described. This recommendation is based on the fact that although weaker concentrations of H_2O_2 gave fair results, more peroxide should probably be used in routine work as a matter of precaution. This amount should be sufficient to take care of the likely variations in the upland prairie and timber types. With unknown soils, two or more concentrations or amounts of peroxide should be used in preliminary studies to determine the amount needed for decomposition."

Effect of organic matter on the water-holding capacity and the wilting point of mineral soils, G. J. Bouyoucos. (Mich. Expt. Sta.). (*Soil Sci., 47 (1939), No. 5, pp. 377–383*).—The author shows that a high percentage of organic matter markedly increases the available water capacity of light soils and to a lesser degree than that of heavier soils. This relation held good whether the percentages were based on weight or on volume. Various organic materials and several soil types were used. The data given indicate that the wilting percentage was also increased by added organic matter but rose less rapidly in proportion to percentage of organic matter than did the water retention.

The geographical distribution of soil black pigment, W. S. Gillam. (Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 5, pp. 371–387, figs. 10*).—The author reports a study of the relation of humus content and soil pigmentation to temperature and precipitation conditions, reaching the following among other conclusions:

"Soils having a relatively high organic matter content do not necessarily have the highest pigment content, nor are they always the darkest in color. The second 6 in. of all samples studied were lower than the top 6 in. in relative pigment content. The relative humus color of the soil extract is proportional to the relative pigment content.

"In regions of approximately equal rainfall, a sigmoid is obtained when organic matter content or relative humus content is plotted against mean annual temperature. Equal differences in precipitation influence the relative pigment, organic matter, and humus contents of the soil more in eastern Nebraska than in western Nebraska. Generally speaking, it can be said that for every fall of 18° F. (10° C.) in mean annual temperature along the two isohyetal lines studied the average soil organic matter and humus contents are approximately doubled, the relative pigment content of the soil is increased [from] two to six times, and the relative humus color is increased [from] two to three times. Equal differences in mean annual temperature have a greater effect on the relative pigment, organic matter, and humus contents of the soil in the area of greater precipitation. With increasing precipitation along an isothermal line the average soil organic matter, relative humus content, and relative pigment content increase, the graphical nature of these relationships being a curve; but the relative humus color increases linearly. With increasing temperature along the isohyets, a linear decrease of relative pigment content and relative humus color was noted.

"The relative pigment content and relative humus color of soil or of sand cultures were not appreciably increased by the addition of organic materials and subsequent decomposition over a period of 62 weeks. Of all soil groups studied, the relative humus content was highest in the podsol sample, followed in order by the gray-brown forest soils, the red and yellow soils, the chernozem

samples, and finally the laterite. The relative pigment content and humus color, excluding the surface few inches of the podsol, were greatest for the chernozem soils, followed by the gray-brown forest soils, the laterite, and red and yellow soils. The laterite and red and yellow samples were fairly high in humus content but low in relative pigment content."

Factors influencing the occurrence of Azotobacter in Iowa soils, W. P. Martin and P. E. Brown. (Iowa Expt. Sta.). (*Soil Sci., 45 (1938), No. 6, pp. 455–466, figs. 2*).—A study of the growth of *Azotobacter* in Clinton and Grundy silt loams showed that an addition of lime to these soils was essential for the prolonged growth of the bacteria and that sufficient to raise the pH to near neutrality was all that was necessary to keep the bacteria active for at least 9 mo. No individual treatment other than lime was essential for the growth of the bacteria in these soils. Except for oat straw, no treatment other than lime, regardless of combination, seemed to have any influence. There was some evidence when lime was present, however, that other treatments may aid the growth of the bacteria, particularly the oat-straw treatment of Clinton silt loam.

It was found that at the same pH, Grundy silt loam presented a better medium for the growth and activity of the *Azotobacter* than did Clinton silt loam. This difference was attributed in part to the higher organic matter content of Grundy silt loam. The limiting pH value for the growth of the *Azotobacter* in these soils was shown to be about 6.0, but it is pointed out that "the actual limiting value for the different types undoubtedly varied with the general soil conditions."

Factors influencing the rate of decomposition of different types of plant tissue in soil, and the effect of the products on plant growth, M. F. Spaulding and W. S. Eisenmenger. (Mass. Expt. Sta.) (*Soil Sci., 45 (1938), No. 6, pp. 427–445*).—The average proportion of nitrogen was found greater in the dicotyledonous than in the monocotyledonous group, ranging in the former from 0.67 to 4.48 percent and in the latter from 0.53 to 2.54 percent. The content of pentosans ranged in the dicotyledons from 5 to 23 percent and in the monocotyledons from 12 to 27 percent. As the nitrogenous content decreased, the content of pentosans increased. The proportion of carbon was highest in the monocotyledonous group, ranging from 42 to 50 percent. In the dicotyledonous group it ranged from 36 to 48 percent, increasing with the content of pentosans.

As the proportion of carbon and pentosans decreased, the rate of decomposition (as shown by the amounts of ammonia and nitrates formed, and by the increased plant growth) increased. The structure of plants and their content of lignin and pentosans (which resist both grinding and decomposition) were also factors in the rate of decomposition. Plants of the dicotyledonous group were more easily ground than plants of the monocotyledonous group and were less resistant to decomposition. If the ratio of nitrogen to carbon is no more than 1:25–30 the plants decompose easily, but if the ratio is wider the incorporation of natural fertilizers in the soil results in a depression of the nitrates.

Maintaining soil fertility in south Jersey, A. W. Blair (*New Jersey Stas. Cir. 383 (1939), pp. [4]*).—This is a popular discussion of the needs of the soils of the area named, which is for the most part well drained and in some need of organic matter and lime. For truck crops from 800 to 2,000 lb. per acre of fertilizers containing from 4 to 6 percent nitrogen, from 6 to 12 phosphoric anhydride, and from 4 to 10 percent potassium may be profitably utilized.

Effect of organic materials and fertilizer treatments upon the soluble nutrients in soils, R. E. Stephenson. (Oreg. Expt. Sta.). (*Soil Sci., 45 (1938), No. 6, pp. 467–475*).—The author determined water-soluble plant nutrients in such organic matter as ground grass clippings, alfalfa hay, and wheat straw

before and after their decomposition in soils. He determined also the percentages of these nutrients fixed in water-insoluble form in the soil during the decomposition.

Micro-organisms appeared to play a considerable part in the absorption not only of nitrates but of potassium and calcium as well. "The liberation of nutrients depends largely upon biological processes and especially upon the solvent effect of the strong acids such as nitric acid. The concentration of cation solutes tends, in general, to follow the abundance of nitrates in the soils studied. The weak carbonic acid does not appear to cause much solvent action, particularly in acid soils. In neutral or alkaline soils the effect of carbonic acid is probably of greater significance. The greatest quantity of water-soluble nutrients is found in the surface soil, where organic matter is most abundant and where biological processes are most active."

Fertilizer experiments simplified (*Puerto Rico Col. Sta. Rpt. 1938, pp. 32, 33*).—A simplified system of fertilizer experiments is briefly reported upon by B. Capó.

The triple-analysis method of testing soil fertility and probable crop reaction to fertilization, H. Lundegårdh (*Soil Sci., 45 (1938), No. 6, pp. 447–454*).—The full test involves three complete analyses as follows: Analysis of the green leaves of the crop, collected before flowering; analysis of the surface soil (citric acid extract of a dry sample taken at a depth of about 15 cm.); and analysis of the subsoil (citric acid extract of a sample taken just below the upper limit of the subsurface layer). The subsoil sample may be omitted in many tests. The analysis comprises determination of H, K, Na, Ca, Mg, Mn, Fe, Cu spectrographically, and PO_4 by colorimetry. Nitrogen nutrition is not included in the test.

Rapid soil tests for estimating the fertility needs of Missouri soils, L. D. Baver and F. H. Bruner (*Missouri Sta. Bul. 404 (1939), pp. 16*).—As a result of an experimental study here reported upon, the authors found that no rapid soil test is universally applicable to all soil or soil conditions. Each test should be carefully investigated in relation to the soils of a given State or region. Rapid soil tests may give misleading results in the hands of those unqualified to interpret them. A standardization of sampling technic is necessary to obtain representative samples of the soils in question. Soil testing in the field, with the exception of the simpler and better known methods, is subject to considerable uncertainty. This is particularly true of those tests used as a basis for making precise recommendations as to the kind and quantity of fertilizer to apply. The authors believe that the use of the same extracting solution for the determination of all nutrients is less reliable than the use of a solution specifically designed for the extraction of each nutrient to be determined. Many of the rapid tests studied were found not to be wholly specific for the plant nutrient to be determined, and were therefore considered liable to disturbing effects of other ions present in the soil tested.

Where comparisons with data from experiment field plats are available, properly interpreted soil tests may be of great value in connection with fertility recommendations. When rapid soil tests have been more completely developed for different soil areas, their use on subsoil samples as well as samples of the surface soil, particularly in relation to the growth and treatment of deep rooted crops, should give valuable information.

The use of chemical data in the prognosis of phosphate deficiency in soils, J. S. Burd and H. F. Murphy (*Hilgardia [California Sta.], 12 (1939), No. 5, pp. 323–340, figs. 2*).—The authors find that the causes of failure to obtain correlations between plant growth and the acid-extractable phosphate of soils

are partly inherent and partly technical. The roles of adsorption complexes, hydrogels, and acid buffers, as affecting the analytical figures obtained by acid extraction of soils, are outlined. It is pointed out that the specific "acidity effect" of reagents cannot be measured in soils containing substantial amounts of adsorbing colloids if the anion of the reagent is itself adsorbed by the soil. The chemical determinations found necessary in the prognosis of phosphate deficiency are stated. A critical analysis of the quantitative effects of the calcium ion ond kaolinite in determining the phosphate solubility of a type soil is presented. Hydrogen-ion concentration, phosphate concentration, present degree of saturation, and adsorption capacity of the adsorbing complex are held to determine the removal of acid-dissolved phosphate both in vitro and in the field. Chemical data on 14 soils are analyzed in the light of the findings stated to illustrate how the physiological supplying power of the soil could be deduced from the data.

Reaction between ammonia and soils, A. N. PURI and A. G. ASGHAR (*Soil Sci., 45 (1938), No. 6, pp. 477–481, figs. 6*).—The reaction of ammonia with soils containing various percentages of exchangeable bases as well as with an ordinary buffer solution was studied. The percentage of ammonia retained by the soils was found to be a function of the pH value and to represent the residual portion of the titration curves when the soil is partly neutralized with another base. There was no evidence of any retention by adsorption.

Potash availability studies in Pennsylvania orchard soils, E. C. DUNKLE, F. G. MERKLE, and R. D. ANTHONY. (Pa. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 5, pp. 438–458, figs. 4*).—An analysis of soil and leaf samples from 47 orchards in various parts of Pennsylvania led to the conclusions that the surface soils were definitely higher than subsoils in replaceable potassium, and loss of top soil by erosion is a factor in increasing the potassium need. Certain soil series were found to contain more replaceable potassium than others. A few were notably low. The quantity of replaceable potassium is related to the organic matter content of the soil. The rapid method for determining replaceable potassium compares favorably with the quantitative cobaltinitrite method and is satisfactory for determining the general level of soil potassium. Leaf analyses did not correlate with the replaceable soil potassium, but in some cases gave indications of the effects of potassium application which could not be detected by exchange analyses.

Influence of exchangeable cations on the availability of phosphate in soils, S. RAVIKOVITCH (*Soil Sci., 47 (1939), No. 5, pp. 357–366, figs. 2*).—The greatest availability was observed when the PO_4 was adsorbed by the Ca soil. The combination of the soil complex with the PO_4 and exchangeable calcium proved to be very unstable, breaking down under the action of very weak acids. The availability of the PO_4 adsorbed by the H complex was low, and its liberation was associated with the partial destruction of the complex. The introduction of Ca into the H complex containing PO_4 in an adsorbed state increased the stability of the complex and decreased the degree of PO_4 liberation. The effectiveness of the various exchangeable cations in liberation of the adsorbed PO_4 was in the order $Na > K > NH_4 > H > Mg > Ca$. These cations, according to their effectiveness in PO_4 adsorption, were arranged in the reverse order. The contact of mineral and organic H complexes with $Ca_3(PO_4)_2$ dissolved the salt. The dissolved phosphate was in part adsorbed by the mineral complex, but it was not retained in any appreciable quantity by the organic complex.

A study of a correlation of chemically available phosphorus with crop yields, A. C. RICHER and J. W. WHITE. (Pa. Expt. Sta.). (*Jour Amer. Soc. Agron., 31 (1939), No. 5, pp. 431–437*).—Truog's method (E. S. R., 64, p. 312) having been used for the determinations of chemical availability, the authors

found no correlation of available phosphorus with crop yields in the comparison of plats receiving various carriers of phosphorus, such as superphosphate, rock phosphate, basic slag, and bonemeal. Plats receiving double or triple quantities of superphosphate showed only small increases in the available phosphorus extracted. The available phosphorus of rock phosphate-treated plats was directly proportional to the amount applied, but it was many times higher than that of plats receiving superphosphate in equivalent quantities. Truog's reagent dissolved considerably more phosphorus from soils treated with rock phosphate than is easily available to the plant as measured by crop yields. The same condition occurred with bonemeal treatments but to a lesser degree.

"The available phosphorus showed an excellent correlation with crop yields on one tier of the Jordan soil fertility plats. The only exceptions were the few plats receiving either bonemeal or manure. If these plats were omitted in the calculation, the coefficient of correlation was 0.91. This high correlation is due to the fact that the phosphorus carrier was always the same, namely, superphosphate, and that these plats are approaching a phosphorus equilibrium after more than 50 yr. of existence."

The rôle of kaolinite in phosphate fixation, H. F. Murphy (*Hilgardia [California Sta.], 12 (1939), No. 5, pp. 341–382, figs. 8*).—Soils with a kaolinic type of clay were found to have a high capacity to fix soluble phosphates, as shown by both chemical and greenhouse experiments, in accord with field results. Phosphate fixation by the various iron systems alone is not considered sufficient to account for all of the properties that these soils show with respect to phosphate availability. Kaolinite ground to colloidal dimensions has a high phosphate-fixing capacity greatest at acid reactions, which indicates that the H_2PO_4 ion is the most favored phosphate ion for the reaction. An increase in base-exchange capacity accompanies the increase in phosphate fixed. Greenhouse experiments show that the availability of the phosphate in "kaolinite phosphate" is directly proportional to the degree of phosphate saturation. This is taken to indicate that a light phosphate fertilizer application would be ineffective on soils containing a kaolinic clay. Even a very low percentage of kaolinite, if in a colloidal condition in a soil, tied up phosphate and made it unavailable for plants. Greenhouse and laboratory data concurred in indicating that bentonite fixed much less phosphate in a nonavailable form than did colloidal kaolinite.

A foliar diagnosis study of the influence of calcium from two sources, lime and superphosphate, W. Thomas and W. B. Mack. (Pa. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 9, pp. 685–693, figs. 3*).—The effects of calcium from lime and from superphosphate were similar, resulting in increased absorption of native soil nitrogen and depressed absorption of native soil potassium as well as of added potassium, with concomitant increases in the absorption of calcium and magnesium.

"Calcium from both sources reduced the intensity of nutrition with respect to nitrogen, phosphoric acid, and potash ($N+P_2O_5+K_2O$) and also lowered the K_2O in the NPK unit from 20 to 8 (in round numbers). Liming resulted in an increase in the nitrogen of the NPK unit and in a relatively great increase in the P_2O_5 made at the expense, principally, of the potash. The yields of grain from the different treatments are classed in relation to the intensities of nutrition and the composition of the mean NPK units. The lowest yields of grain are associated not with treatments (check, dried blood) having the lowest intensity of nutrition but with the lowest P_2O_5 in the NPK unit. A reduction of 58 percent in P_2O_5 in the NPK unit of the check as compared with P brought about a reduction in yield of grain not offset by the accompanying increase o

142 percent in K_2O in the NPK unit which occurred at the expense, principally, of P_2O_5."

Sufficiency of atmospheric sulfur for maximum crop yields, F. J. Alway, A. W. Marsh, and W. J. Methley. (Minn. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 2 (1937), pp. 229–238, figs. 4*).—The annual fall of sulfur in rain, snow, and dust in Minnesota has been found to vary from a maximum of more than 100 lb. an acre in Minneapolis to a minimum of less than 5 lb. in a sulfur-deficient area in the northern part of the State. Where the collection of the water for analysis was made in vessels entirely or partly of a metal subject to attack by sulfur dioxide erroneously high values were found, the sulfates formed between rains on the interior metal surfaces being washed down into the collector and appearing as though brought down in the precipitation. An appreciable amount of sulfur dioxide was found in the atmosphere even in the most remote and most sulfur-deficient areas of the State. Its relative concentration was determined by absorption on a surface coated with lead peroxide. The amount absorbed in the course of 12 mo. per acre of exposed surface varied from more than 400 lb. of sulfur in Minneapolis to less than 5 lb. near the headwaters of the Mississippi River. The absorption of sulfur dioxide by soils was found to parallel roughly its absorption by lead peroxide, but likely to furnish less sulfur to crops than that brought down by the precipitation. It is computed that the sulfur dioxide absorbed by the leaf tissue of plants in sulfur-deficient areas will be of even much less significance than that absorbed by the soil.

Registration, labeling, and inspection of commercial fertilizers, 1938, M. F. Miller, L. D. Haigh, and E. W. Cowan (*Missouri Sta. Bul. 403 (1939), pp. 45*).—The usual analytical data are here given for the 1938 season, with some related information. The total tonnage of mixed fertilizers increased from 1932 to 1936 and then fell off somewhat. The percentage of high grade mixtures has increased from 1932 through 1938.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1938, C. S. Cathcart (*New Jersey Stas. Bul. 657 (1939), pp. 35*).—Tabulations and summaries of the results of the greater part of the 1938 inspection analyses are here given, the remainder in the bulletin noted below.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1938, C. S. Cathcart (*New Jersey Stas. Bul. 662 (1939), pp. 15*).—This bulletin presents the data not included in the report noted above, together with a discussion of the year's fertilizer inspection work as a whole.

AGRICULTURAL BOTANY

[Abstracts of papers presented at Colorado State College of Education, 1938] (*Jour. Colo.-Wyo. Acad. Sci., 2 (1939), No. 5, pp. 29, 30, 31, 33, 34, 35, 36*).—Abstracts of the following papers of interest to botany are included: Comparative Effects on Primordial Tissue of X-Radiation and Treatment With Certain Growth-Promoting Substances, by V. C. Irvine; Floral Development of Certain Species as Influenced by X-Radiation of Buds, by E. L. Johnson; Further Studies of High Frequency Irradiation Upon *Hordeum vulgare*, by C. R. Bitter; New Facts About Old [Alfalfa] Seeds, by A. M. Lute, and A Note on the Composition of Russian Thistle, by H. W. Reuszer and R. W. Monk (both Colo. State Col.); Life Forms of Plants in Colorado Sand Hills, by F. Ramaley; Is the Genus a Natural Category? by M. T. James (Colo. State Col.); Genesis of Earth Forms and Its Effect Upon Some Southwestern Delphiniums, by J. Ewan; and Rushing in Where Scientists Fear to Tread (New Avenues in Systematic Botany), by M. W. Pesman.

Kansas botanical notes, 1937, F. C. GATES. (Kans. State Col.). (*Kans. Acad. Sci. Trans., 41 (1938), pp. 97, 98*).—This consists largely of seasonal notes, but includes brief references to a survey said to indicate red cedar, Chinese elm, and Osage orange to be the best trees suited for the semiarid conditions of western Kansas, and to a natural cross between Atlas sorgo and Johnson grass in which many fertile seeds were produced.

Woody plants, native and naturalized in Kansas, F. C. GATES. (Kans. State Col.). (*Kans. Acad. Sci. Trans., 41 (1938), pp. 99–118, figs. 208*).—This check list is presented to replace Trees in Kansas,[2] but without descriptions, keys, or drawings. The 225 species, varieties, and hybrids included are grouped under 45 families. Of this number, the native flora is said to contain 107 kinds of trees, 80 of shrubs, and 20 of lianas. Indexes to families, genera, and common names, and 208 distributional maps are included.

Ecology in agriculture, H. C. HANSON. (N. Dak. Expt. Sta.).—(*Ecology, 20 (1939), No. 2, pp. 111–117*).—The author describes a few examples to illustrate the need for ecologists to conduct research in crop plants, the importance of climax or near-climax stages, and the special contribution of ecology to ferret out the relationships of man with his agricultural environment. "Permanent agriculture must be in adjustment with the environment."

The interrelation of soils and plant, animal, and human nutrition, E. C. AUCHTER. (U. S. D. A.). (*Science, 89 (1939), No. 2315, pp. 421–427*).—In this address the author outlines the cycle of energy exchange through soil, plant, and animal, discussing the mineral requirements of plants and animals, some soil deficiencies resulting in nutritional disorders of plants and animals, the production and use of energy, factors affecting the value of plants as food, and suggested investigations and objectives.

The individualistic concept of the plant association, H. A. GLEASON (*Amer. Midland Nat., 21 (1939), No. 1, pp. 92–110*).—The author defines and discusses the individualistic concept of plant associations and compares it with other theories.

The unistratal concept of plant communities (the unions), T. LIPPMAA (*Amer. Midland Nat., 21 (1939), No. 1, pp. 111–145, figs. 11*).—A review and discussion of this ecological concept, with a three-page bibliography.

Plant associations on land, H. S. CONARD (*Amer. Midland Nat., 21 (1939), No. 1, pp. 1–27*).—This is a critical review of published works and concepts (with about four pages of references) on plant sociology, the goals of which are stated to be "an understanding of the order of nature" and "directions for the wisest use of land."

The biome, J. R. CARPENTER (*Amer. Midland Nat., 21 (1939), No. 1, pp. 75–91*).—A critical review (with over three pages of references) of the ecological concept of the biome.

The climax and its complexities, S. A. CAIN. (Univ. Tenn.). (*Amer. Midland Nat., 21 (1939), No. 1, pp. 146–181*).—This is a comprehensive, analytical review of climax vegetation, with about five pages of references.

Pollen analysis of a bog in northern Idaho, H. P. HANSEN (*Amer. Jour. Bot., 26 (1939), No. 4, pp. 225–228, fig. 1*).—Five ecologic periods were indicated by this study, and the interpreted climatic sequence in this region apparently correlates closely with that farther south near Spokane, Wash., and to some extent with that in the Puget Sound region.

Marsh gas in the ecology of some peat-bogs, H. A. ALLARD. (U. S. D. A.). (*Science, 89 (1939), No. 2319, pp. 533–535*).—This is a discussion of the environal

[2] Kans. State Bd. Agr. [Quart.] Rpt., 47 (1928), No. 186–A, pp. 372, figs. 210.

relations of peat bogs, with special reference to a bog near Oxford, Mass., in which methane was observed to collect beneath the root layers of the sedge mat as a zone of bubbles. The plant life here would seem to substantiate the assumption of a relatively inactive physiological behavior of this gas. It may at least be an important factor under some conditions in helping to create a low oxygen atmosphere in the water and air surrounding the roots of a group of normal associations of these areas which are highly tolerant of such conditions.

The ecological problem of mycotrophy, L. G. Romell (*Ecology, 20 (1939), No. 2, pp. 163–167, fig. 1*).—The author reviews published data (17 references) on the mechanism of mycotrophy, concluding for conifers that, considering all the knows facts, there seems to be scarcely an escape from assuming that the associated obligate mycorhizal fungi are not saprophytes decomposing soil organic matter but are energetically parasites on their hosts. A root mass presenting the same surface and omnipresence would seem to require a much greater expenditure of assimilates. "If this is so, a sufficient root system would be more of a parasite on the tree than the mycorhizal fungi are, and it is easy to realize how the mycorhiza can be a 'beneficial disease.'" Reference is also made to the orchid mycorhizas and to the ecology of the chlorophyll-free Monotropas.

Legume nodule development in relation to available energy supply, F. E. Allison and C. A. Ludwig. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 149–158*).—Considering recently published data and interpretations (19 references, including the authors'), the following conclusions are drawn: Although there are many special factors independently influencing nodule behavior, the amount of available carbohydrates reaching the roots is normally the chief influence affecting nodule formation under variations in photosynthesis and in the presence of either free or varying amounts of combined nitrogen. When there is no N assimilation, N is present in minimum and carbohydrate is not the controlling factor. The inhibiting effect on nodulation of large additions of fixed N is due chiefly to the resultant decrease in available carbohydrates. Growth of roots relative to tops is also lowered for the same reason. A small change in sugar concentration in the root sap may produce a change in nodule mass several times as large during a considerable growth period because the weight of the nodules, like the total dry weight of the plant, tends to increase exponentially. The carbohydrate supply theory is believed to account for varying degrees of nodulation under different growth conditions more simply, directly, and adequately than the subsequently proposed carbohydrate-nitrogen relation theory.

A relationship between pollination and nodulation of the Leguminoseae, J. K. Wilson. (Cornell Univ.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 159–170*).—The evidence presented indicates that a relationship may exist between pollination and nodulation in legume species. Those that are completely self-pollinating may not bear nodules, or when they do the number of *Rhizobium* strains with which they will symbiose is small. When cross-pollination is obligatory the number of strains with which the plant will symbiose is comparatively large. The *Rhizobium* strains symbiosing with self-pollinating species appear predominantly monotrichic, while those symbiosing with cross-pollinating species appear predominantly multitrichic, though both morphological types may be found symbiosing with the latter plants. Such relationships apparently do not correlate with the order, tribe, genus, or species of the plants, except as they may be influenced by pollination. If this suggested relationship proves valid it will place symbiosis on a heritable basis and in the same category with the inheritance of resistance to certain plant diseases.

Cell polarity and the differentiation of root hairs, E. W. Sinnott and R. Bloch (*Natl. Acad. Sci. Proc.*, *25* (*1939*), *No. 5*, *pp. 248–252*, *fig. 1*).—Using a technic recently described by Sinnott,[3] root hair development was studied in *Phleum pratense*, *Poa trivialis*, *Chloris gayana*, and *Sporobolus cryptandrus*, and is described. Pronounced and regular differences between cells in their capacity to form root hairs, and between related genera in the time and character of root-hair differentiation, were found and should be taken into account in studies dealing with the factors responsible for root-hair development. Whatever the causes, it seems clear from the data presented that in related grass genera there are markedly different types of root-hair determination—in one, differentiation is early and strongly apical; in another, late and but slightly or not at all apical.

A developmental analysis of the relation between cell size and fruit size in cucurbits, E. W. Sinnott (*Amer. Jour. Bot.*, *26* (*1939*), *No. 4*, *pp. 179–189*, *figs. 14*).—In 12 races of 4 cucurbit genera the cell diameter was measured in a series of tissues from the central region of the ovary to the outside and at many developmental stages from very small ovary primordia to mature fruit. In each tissue growth was found to occur at first chiefly by cell multiplication, but after attainment of a specific cell size division ceased and further growth was by cell expansion. The innermost tissues, as compared with successive outer ones, showed more rapid increase in cell size during the cell-division period, earlier cessation of division, and greater cell size at that time. In *Cucurbita pepo*, large-fruited as compared with small-fruited races typically showed no difference in cell size during early development, a longer period of cell division due to less rapid increase in cell size, greater cell size at the last division, a longer interval between cessation of division in successive tissues, and a greater cell expansion after cessation of cell division. Specific developmental differences between *Cucurbita* and the other 3 genera studied (*Lagenaria*, *Cucumis*, and *Citrullus*) are described, and possible mechanisms responsible for the differences in cell division and cell expansion among the various tissues in the various races are discussed. The problem of the size relations of cell and organ is noted as part of the more general problem of the factors determining growth and differentiation, and the first step in solving this problem is through descriptive analyses in quantitative terms.

Anatomy of the hypocotyl and roots of Daucus carota, L. Havis. (Ohio Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 8*, *pp. 557–564*, *pls. 7*, *fig. 1*).—The carrot epicotyl is enclosed in a short cotyledonary tube, and lateral roots arise both from the lower hypocotyl and the primary root. The seedling transition zone is in the upper part of the hypocotyl and relatively short. Both primary and lateral roots are diarch. The edible part of the carrot is largely hypocotyl, though the upper taproot is also often enlarged, the relative amounts depending on the variety. At first the cambium and pericycle are active, and as the carrot develops further the xylem and phloem become meristematic, with considerable enlargement especially of the xylem parenchyma. The cortex is shed when the fleshy root and hypocotyl are 3–5 mm. in diameter, the cork cambium then being derived from the pericycle. The mature structure is composed largely of xylem, phloem, and pericyclic parenchyma. Lateral roots originate in the pericycle and at an angle of ±45° with the primary xylem cylinder, and also often at the periphery of the pericycle during early secondary growth and likewise after the cortex of the hypocotyl has disappeared. The latter type arises near the place of emergence of the endogenous lateral root.

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[3] Natl. Acad. Sci. Proc., 25 (1939), No. 2, pp. 55–58.

A correlation between sulfhydryl, mitosis, and cell growth in length in roots of Phaseolus vulgaris, F. S. Hammett and S. S. Chapman (*Growth, 2 (1938), No. 4, pp. 297–302*).—Quantitative analyses for sulfhydryl (SH) of root sections of sprouting beans established a positive correlation between proliferation activity and SH concentration, and a negative one between SH concentration and root growth by cell elongation. The order of increasing SH amount was midsection, contiguous meristem, and terminal meristem. It is concluded that this finding agrees with the postulate that SH is specifically associated with cell increase in number as distinct from cell increase in size.

Diurnal cycle of heat resistance in plants, H. H. Laude. (Kans. Expt. Sta.). (*Science, 89 (1939), No. 2320, pp. 556, 557*).—This daily cycle was discovered in several field-crop plants, including corn, wheat, barley, sorghum, and alfalfa. The maximum resistance was attained about midday and continued during the afternoon, while the minimum prevailed early in the morning. The heat resistance increased on exposure to electric light and decreased in darkness. The degree of temperature required to distinguish differences in heat resistance depended on the species and the condition of the plants. Specific examples of the experimental results and suggested explanations of the phenomenon are given.

Bergey's manual of determinative bacteriology: A key for the identification of organisms of the class Schizomycetes, D. H. Bergey, R. S. Breed, E. G. D. Murray, A. P. Hitchens, et al. (*Baltimore: Williams & Wilkins Co., 1939, 5. ed., pp. XI+1032*).—Whereas the first edition included descriptions of 832 bacterial species with a reference to the original place of publication of 1,577 descriptions, this edition contains descriptions of 1,335 species with a reference to the original place of publication of 5,600 descriptions. These figures graphically indicate the development occurring since 1923. The chief changes from the fourth edition (E. S. R., 71, p. 28) occur in the Eubacteriales, where the number of recognized families has been increased from 3 to 12. The genus *Bacterium* has been retained to include species whose relationships are obscure. Nine new generic names are used: *Veillonella, Malleomyces, Noguchia, Microbacterium, Fusobacterium, Proactinomyces, Caulobacter, Pasteuria, and Blastocaulis*—the last three in the new order Caulobacteriales. It will be noted that in spite of the extensive rearrangement of genera and the use of nine new generic names, few new binomials have been formed, and no trinomials are used. Nearly all the species descriptions have been checked against the original descriptions, and the keys have been improved. See also a note by Burkholder (E. S. R., 80, p. 781).

After suggestions for use of the manual in classifying unknown organisms, there are the following general sections: Historical survey of classifications of bacteria, with emphasis on outlines proposed since 1923 (pp. 4–38), and rules of nomenclature (pp. 51–68), both by R. S. Breed (N. Y. State Expt. Sta.); and how bacteria are named and identified, by R. E. Buchanan (pp. 39–50) (Iowa State Col.).

Cytological appearances in a spore-forming bacillus: Evidence of meiosis, L. A. Allen, J. C. Appleby, and J. Wolf (*Zentbl. Bakt. [etc.], 2. Abt., 100 (1939), No. 1–3, pp. 3–16, pls. 2, figs. 5*).—A bacillus isolated from grass, observed by a vital-staining technic, exhibited a cycle of changes in morphology and cytology as the culture progressed from extreme youth to old age, and these phenomena are discussed in detail and illustrated. Spores are said to be formed in several ways, one method involving well marked nuclear reorganization within the cell. Evidence of the presence of chromosomes and of structures suggestive of meiosis are reported to have been clearly seen preceding the

above type of spore formation, during germination of some of the liberated spores sown on fresh media, and in some of the liberated spores in the so-called "resting" condition.

Growth of microorganisms in shake cultures under increased oxygen and carbon dioxide tensions, J. W. WILLIAMS (*Growth, 3 (1939), No. 1, pp. 21-33, fig. 1*).—The changes, in general of the same order, are discussed without reference to individual organisms (*Escherichia, Pseudomonas, Staphylococcus, Proteus, Bacillus*, and *Salmonella* species used). The depth of the upper limit of spectral growth (subsurface growth bands under increased gas tensions) was found to depend on O_2 and CO_2 tensions (pressure chambers used), time and temperature of growth and its initiation, number of organisms planted, percentage of nutrient, growth inhibitory factors, and reducing and oxidizing agents. Width and consistency of spectral growth depended on time of growth, percentage of nutrient, $O_2:CO_2$ ratio, growth inhibitory factors, reducing and oxidizing agents, number of organisms planted, temperature of growth and its initiation, and substances encouraging anaerobic growth. Within limits, O_2 counteracted the inhibiting effects of CO_2. The Eh and pH of the medium above the spectrum were similar to controls, but decrease usually occurred in and below the growth to a varying extent and depth with certain organisms. Changes in bromothymol and methylene blue in media were what would be expected from Eh and pH readings. All organisms studied were able to concentrate methylene blue to a variable extent in lines and bands in and directly above their spectrums, and some were able to change the blue to its various azures. Explanation of the various changes is suggested, and evidence is presented pointing to an O_2 diffusion gradient in the media studied. Most appearances produced with inanimate precipitates in gels were produced by bacterial growths in shake cultures.

It is believed that the great possibilities presented by growing microorganisms under increased gas tensions should win this method a place with anaerobic and aerobic methods of growth in bacteriological studies.

Optimum solutions as physiological reference standards in estimating nitrogen utilization by Aspergillus niger, R. A. STEINBERG and J. D. BOWLING. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 10, pp. 717-732, figs. 3*).—Yield curves with graduated amounts of nitrogen were obtained with *A. niger* grown in optimum nutrient solutions for 4 days at 35° C. Of the duplicate cultures, 45 percent agreed within ±1 percent, 68 percent within ±2, 82 percent within ±3, and 95 percent within ±5 percent. On repetition, yields could be verified within ±5 percent. Growth with NH_4NO_3 was studied at three carbohydrate-nutrition levels and compared to that obtained with NH_4Cl and with $NaNO_3$. The growth and total N curves obtained with 2.5, 5, and 7.5 percent of sucrose were proportional and identical in form when superimposed, and other results for these solutions were also practically identical. At intermediate N concentrations, NH_4Cl gave lower and $NaNO_3$ still lower yields than did NH_4NO_3. Total N in the mycelial felts grown with NH_4NO_3 increased linearly with increasing N concentration. Values for total N in the felts could be computed within the limits of accuracy for the chemical determinations. It is assumed that the fungus invariably contained 2 percent of protoplasmic N, and that the balance of the N supplied was partitioned between the organism and the solution similarly to the distribution of a dissolved substance between two immiscible solvents. The values of yield curves with NH_4NO_3 could not be duplicated by computation with the Mitscherlich growth equation.

Influence of bile and bile salts on Aërobacter aërogenes, J. E. FULLER. (Mass. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 4, pp. 507-*

510).—The results of culturing 30 strains of *A. aerogenes* in media containing bile or bile salts were in favor of the stability of the culture reactions of pure established culture so far as the influence of these substances was concerned, and no evidence that this organism is a derivative of *Escherichia coli* was obtained.

Isoplanogametes in Blastocladia, E. A. Bessey (*Mycologia, 31 (1939), No. 3, pp. 308–309*).—This type of sexual union observed in *Blastocladia* is compared with that by heteroplanogametes in the closely related fungus *Allomyces*.

Some Pezicula species and their conidial stages, J. W. Groves (*Canad. Jour. Res., 17 (1939), No. 5, Sect. C, pp. 125–143, figs. 4*).—"The following species of *Pezicula* have been cultured and the genetic connection of their conidial stages has been established: *P. carpinea* (Pers.) Tul. with the conidial stage *Cryptosporiopsis fasciculata* (Tode) Petr., *P. pruinosa* Farl. with the conidial stage *Sphaeronema pruinosum* Peck, *P. corni* with the conidial stage *C. cornina* (Peck) Petr. and Syd., *P. rubi* (Lib.) Niessl with the conidial stage *Discosporiella phaeosora* (Sacc.) Petr., and *P. hamamelidis* n. sp. with the conidial stage a *Cryptosporiopsis* species. The form of the conidial spore is relatively constant in the different species, but the form of the conidial fruiting body is variable."

Growth of fungi in synthetic nutrient solutions, R. A. Steinberg. (U. S. D. A.). (*Bot. Rev., 5 (1939), No. 6, pp. 327–350*).—This comprehensive review (99 references) discusses the subject relative to carbon, nitrogen, mineral, and supplementary organic requirements, the protoplast-solution system, nutrient requirements for reproduction, and induction of variants with chemicals. It is pointed out that in recent years the trend has seemed to emphasize studies of accessory factors and mineral nutrition, with but little on the physiology of reproduction or on carbon requirements and little or none on enzymes of fungi. Certain suggestions and warnings concerning future investigations are given.

Root temperature effects in a nutrient solution, L. H. Jones and G. E. O'Brien (*Massachusetts Sta. Bul. 355 (1939), p. 28*).—A brief progress report on work with gardenia and soybean.

Further analysis of the pea test for auxin, F. W. Went (*Bul. Torrey Bot. Club, 66 (1939), No. 6, pp. 391–410, figs. 4*).—In this study the method previously used (E. S. R., 78, p. 759) was simplified by marking the stems with a lanolin-lampblack suspension and transferring the marks, which do not dry up, to paper. The pea test curvatures, appearing when etiolated stems are split in the growing region and placed in auxin solutions, are due to differential tissue growth under the intact epidermis and the tissues bordering the wound. This is not an innate differential sensitivity, but is due to the rapid loss of sensitivity of the tissues near the wound. When auxin reaches the cells before the loss of sensitivity small pea test curvatures or none result. The author resolves the auxin effect in the pea test into a chain of two reactions—(1) the so-called preparatory reaction, which is independent of pH and can be induced by substances lacking growth activity (hemiauxins), indole compounds inducing this reaction in relatively high concentrations, and (2) the growth reaction proper, which follows (1) in time and requires a much lower auxin concentration. With these new data it is believed that a number of peculiarities can be explained. A greatly improved pea test for very low auxin concentrations is described.

Is auxin produced in roots? J. Van Overbeek (*Natl. Acad. Sci. Proc., 25 (1939), No. 5, pp. 245–248, figs. 2*).—Although under the conditions described in this preliminary report, using excised root tips of germinating peas on dextrose agar blocks, no evidence was found for auxin production, this is not taken

necessarily to mean that under natural conditions (intact roots) no production will occur. Attention is called to recent evidence by Addicott and Bonner (E. S. R., 80, p. 600) that excised pea roots grown in vitro under sterile conditions in a complete medium (containing both vitamin B_1 and nicotinic acid) may be able to synthesize auxin.

Induced parthenocarpy of watermelon, cucumber, and pepper, C. WONG. (Mich. State Col.). (*Science, 89 (1939), No. 2314, pp. 417, 418*).—A preliminary report on naphthaleneacetic acid-induced parthenocarpy.

Properties of a new growth factor for lactic acid bacteria, E. E. SNELL and W. H. PETERSON. (Univ. Wis.). (*Jour. Biol. Chem., 128 (1939), No. 3, pp. XCIV, XCV*).—An abstract.

The metabolism of amides in green plants.—III, The mechanism of amide synthesis, H. B. VICKERY and G. W. PUCHER. (Conn. [New Haven] Expt. Sta. et al.). (*Jour. Biol. Chem., 128 (1939), No. 3, pp. 703–713*).—In continuation of the series (E. S. R., 81, p. 186) and on the basis of a critical review (28 references), explanations that have been advanced for the formation under certain circumstances of asparagine and glutamine in plants are discussed. The Prianischnikow ammonia detoxication theory is found inadequate to account for the behavior of the amides in ammonia-rich rhubarb leaves or in tobacco leaves grown under conditions giving rise to high ammonia concentrations. It has been suggested that the Krebs citric acid cycle theory proposed to account for carbohydrate respiration in animals might be applied to plants. This scheme of reactions provides means whereby oxaloacetic acid and α-ketoglutaric acid, the most probable precursors of asparagine and glutathione, respectively, arise from several sources. On this view the amide metabolism becomes a phase of the general respiratory activity of the tissues and undue emphasis on ammonia as a stimulant to the reaction is removed. It is shown that the amide behavior in leaf tissues cultured under various conditions agrees with this conception, the variations in the nature and rate of amide formation being explicable in terms of variations in the details of the respiratory mechanism.

Starch dissolution and amylolytic activity in leaves, H. A. SPOEHR and H. W. MILNER (*Amer. Phil. Soc. Proc., 81 (1939), No. 1, pp. 37–78, figs. 2*).—"More precise knowledge of the conditions affecting certain enzymes in the living leaf is of importance for an understanding of the processes resulting in the accumulation and disappearance of the products of photosynthesis. For this purpose amylase deserves special consideration, because starch is the first visible product of photosynthesis and also serves as transitory reserve food material. Certain leaves are capable of undergoing starch dissolution in an atmosphere free of oxygen, although the rate of this activity under these conditions is lower than that in normal air. Starch dissolution does not occur in leaves which have been killed by means which do not destroy the enzyme. Higher concentrations of carbon dioxide exert a distinctly inhibiting effect on the rate of starch dissolution of leaves. Comparative determinations of the amylolytic activity of a number of different species of leaves have been made. These show great variation, and also considerable range in the pH of maximum activity of different species. Both starch dissolution and amylolytic activity are decidedly accelerated with the loss of water from the leaves. Also, with decreased temperatures some leaves exhibit an increased amylolytic activity and in some cases an increased rate of starch dissolution." There are 38 literature references.

The effect of zinc on the growth process, H. S. REED and J. V. BECK. (Univ. Calif.). (*Growth, 3 (1939), No. 1, pp. 1–7, figs. 3*).—Corn grown in tanks of Delhi, Calif., soil without added zinc developed deficiency signs comparable to those obtained in culture solutions of purified salts. In all three experiments reported the height and dry weight of the plants exhibited consistent differences

in favor of small amounts of Zn, while its deficiency curtailed the production of cobs and kernels more than that of stalks, leaves, and husks. The grand period of growth of the minus- and plus-Zn plants was about the same. The equations for the growth curves of the two lots of plants resembled each other, though the values of the constants representing final and half-time height were greater for the plus-Zn series.

The loss of carbon from excised rhubarb leaves during culture, H. B. VICKERY and G. W. PUCHER. (Conn. [New Haven] Expt. Sta. et al.). (*Jour. Biol. Chem., 128 (1939), No. 3, pp. 685–702*).—Determinations of total and insoluble carbon in a series of rhubarb leaves are discussed in terms of C losses due to respiration occurring when the leaves are subjected to culture under various conditions. Respiration is shown to draw on components other than carbohydrates, even when leaves of reasonably high carbohydrate content are taken. With initial low carbohydrate content it was possible to demonstrate that an appreciable amount of C lost by respiration originated from the proteins of the leaf blade tissue. These were hydrolyzed promptly in all cases, and it is suggested that the residues remaining after oxidative deamination of the amino acids may be more or less completely oxidized subsequently. Leaf cultures in glucose solution or in water in the light had but little effect on the rate of hydrolysis of the protein except possibly to stimulate the initial phase, and, in spite of the additional carbohydrate supply to the leaves thus furnished, evidence that a part of the protein C was respired could still be obtained. Thus, even when carbohydrate is supplied to the leaves, respiration may still draw on a wide assortment of tissue components.

Speculative and highly generalized relationships of the carbohydrates, organic acids, and proteins with respiration have been recently suggested by Gregory and Sen (E. S. R., 78, p. 605). With them the present results were found, in general, to agree, although no information with regard to detailed chemical mechanisms has been secured.

The effect of sterilization with calcium hypochlorite on germination of certain seeds, J. N. SPAETH and M. AFANASIEV. ([N. Y.] Cornell Expt. Sta.). (*Jour. Forestry, 37 (1939), No. 5, pp. 371, 372*).—"Although the retarding effect of calcium hypochlorite on the germination of seeds is not universal, the authors show that it not only retards the germination of certain forest tree [*Magnolia* and *Robinia* species] seeds but also greatly reduces the germination percentage."

A small hygrometer, D. E. HOWELL and R. CRAIG. (Univ. Calif.). (*Science, 89 (1939), No. 2319, p. 544, fig. 1*).—This sensitive and inexpensive hygrometer consists of the balance wheel, hairspring, and small parts of the bearing plates of a small jeweled wrist watch attached to a glass plate, with an ether- and alcohol-washed human hair as the indicator. It is said to be accurate, easily read without changing the humidity, and usable in very small spaces.

A simple mechanical thermoregulator, A. C. BRATTON (*Science, 89 (1939), No. 2321, pp. 589, 590, fig. 1*).—The apparatus described and illustrated uses the principle of controlled cooling for regulating the temperature of a bath. The advantages claimed over the usual electric types are its comparable sensitivity at lower cost, with its greater dependability and simplicity. Three types of bulb to be attached to the control head of the thermoregulator are described, with sensitivity ranging from ±0.01° to ±0.003°.

Another photoelectric device for measuring leaf areas, R. E. GIRTON and C. H. GARDNER. (Purdue Univ.). (*Ind. Acad. Sci. Proc., 53 (1937), pp. 72, 73*).—An abstract.

Vital-staining of plant cells, E. KÜSTER (*Bot. Rev., 5 (1939), No. 6, pp. 351–370*).—This critical review (six pages of references) discusses the subject rela-

tive to cytoplasm, nucleus, plastids, chondriome, cell walls, vacuole, determining pH values of cells or their vitally stained parts, oxidation-reduction potentials, and general considerations.

GENETICS

Recent developments in our knowledge of chromosome structure and their application to genetics, T. S. PAINTER (In *Science in Progress*, edited by G. A. BAITSELL. *New Haven, Conn.: Yale Univ. Press; London: Oxford Univ. Press, 1939, pp. 210–232, figs. 3*).—Recent developments in cytogenetics, based largely on advances opened up by the salivary chromosome technic, are summarized.

Interpretation of Mendelian class frequencies, W. A. HENDRICKS, J. P. QUINN, and A. B. GODFREY. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 10, pp. 755–760*).—A new chi-square table which facilitates the interpretation of Mendelian class frequencies is presented.

A graphic method for the rapid analysis of Mendelian distributions [trans. title], J. L. PEDELABORDE (*Rev. Argentina Agron., 6* (*1939*), *No. 1, pp. 35–40, figs. 3; Eng. abs., p. 40*).—A graphic method presenting the relation of theoretical ratios to their probable errors is suggested for ready reference and rapid indication of what ratio best fits the observed data.

Genetics of chlorophyll deficiencies in red clover (Trifolium pratense L.), I, II, R. D. WILLIAMS (*Jour. Genet., 37* (*1939*), *No. 3, pp. 441–482*).—Two contributions are presented.

I. *Albinos* (pp. 441–458).—The characteristics, behavior, and linkage relations of eight simple recessive chlorophyll-deficient factors, w_1 to w_8, inclusive, governing the formation of albino seedlings in red clover are reported. Most of these factors were shown to be genetically distinct from seven yellow lethal seedling factors noted below. Ten other white seedling types apparently due to simple recessive genes but not yet tested are noted.

II. *Yellow seedling factors* (pp. 459–482).—Seven simple recessive factors governing the production of yellow chlorophyll-deficient lethal seedlings in red clover were identified and designated y_1 to y_7, inclusive. They were shown to be genetically different from each other and from the eight white seedling factors with which they were tested. Their characteristics, behavior, and linkage relations are described. Nine other yellow lethal chlorophyll deficiencies, also inherited on a simple Mendelian basis, were isolated.

Genetic studies with factors in the tenth chromosome in maize, M. M. and V. H. RHOADES. (U. S. D. A.). (*Genetics, 24* (*1939*), *No. 2, pp. 302–314, pl. 1, fig. 1*).—The linkage data presented placed the gene (*Rp*) for resistance to rust (*Puccinia sorghi*) in the genetic map of chromosome 10, and also determined the linear order and map position of the *li* (lineate) and d_1 (dwarf) loci. A previously undescribed character, designated sp_1 (small pollen), had a semilethal effect upon the male and female gametophytes. Pollen grains carrying sp_1 did not differ visibly from normal grains except that they were smaller, yet 96.6 percent of sp_1 grains could not compete successfully with normal pollen. Forty-four percent of sp_1 eggs were infertile and did not develop into mature kernels. Crossing over was reduced in adjacent regions when sp_1 was heterozygous. The data placed sp_1 approximately one cross-over unit to the left of *li*. Cytological studies at pachytene disclosed no chromosomal irregularity in $+sp_1$ plants. Other linkage data presented located another new gene l_1 (luteus) between *li* and g_1.

The genetic map for chromosome 10 was extended from 32 to 84 units by the linkage data, which determined the sequence and map positions as follows:

Rp	sp_2	*li*	l_6	g_1	*R*	d_7
0	27	28	38	43	57	84

Earlier cytological observations had placed *Rp* in the distal one-fourth of the short arm of chromosome 10 (E. S. R., 73, p. 764) and the *R* locus in the distal 22 percent of the long arm (E. S. R., 71, p. 30).

Heritable characters in maize.—L. Vestigial glume, G. F. SPRAGUE. (Mo. Expt. Sta. and U. S. D. A.). (*Jour. Hered., 30 (1939), No. 4, pp. 143–145, figs. 3*).—The series (E. S. R., 74, p. 181) is continued.

Appearing in corn from Belgian Congo, vestigial glume (*Vg vg*) was found dominant to normal. The plants are characterized on the tassels by reduction in glume size and exposure of anthers and on the cobs by reduced outer glumes and almost completely suppressed flowering glumes and palets. Vestigial glume plants are fully viable, of normal size, and compare favorably with their *vg* sibs in yield. *Vg* belongs in the first linkage group in the suggested order f_1-*Vg*-*br*-bm_2. Since in certain types of canned sweet corn the whole grains are removed from the cob, often with portions of glumes adhering, introduction of *Vg* into sweet corn stocks is being attempted to eliminate this undesirable feature.

The occurrence of parthenogenetic diploids in tetraploid maize, L. F. RANDOLPH and H. E. FISCHER. (U. S. D. A. and [N. Y.] Cornell Expt. Sta.). (*Natl. Acad. Sci. Proc., 25 (1939), No. 4, pp. 161–164*).—The parthenogenetic corn diploids in general resembled in appearance and breeding behavior the diploid stocks from which their maternal tetraploid parents were derived.

Incidence and inheritance of pollen sterility in the potato, F. A. KRANTZ, C. L. BECKER, and Z. M. FINEMAN. (Minn. Expt. Sta. and U. S. D. A.) (*Jour. Agr. Res. [U. S.], 58 (1939), No. 8, pp. 593–601*).—Studies on 2,786 individuals derived from 101 selfed lines of the potato indicated that 47.8 percent flowered and 60.9 percent of the flowering individuals set fruit. The failure of the remainder of the flowering individuals to set fruit, according to evidence from hand cross-pollinations, might have been due to environmental factors. The pollen and fruit setting for 514 individuals of 69 families showed association between amount of stainable pollen and number of individuals within the group that set seed. On the basis of the observations, 94.7 percent of the total population had viable pollen in adequate quantities for setting fruit naturally. Association was observed between percentage of stainable pollen and changes in environmental conditions. In studying the inheritance of pollen sterility in a cross between Lookout Mountain and Minnesota Accession 123, stainability was used to differentiate between viable and nonviable pollen. The segregation obtained could be explained by assuming the presence of a tetrasomic gene which, when present in the pollen in the homozygous condition, is lethal and, in the heterozygous condition, partly lethal.

Heritable variations in Nicotiana tabacum L. induced by abnormal temperatures, and their evolutionary significance, D. KOSTOFF and M. SARANA (*Jour. Genet., 37 (1939), No. 3, pp. 499–547, pls. 2, figs. 6*).—Abnormal temperatures induced in *N. tabacum macrophylla* irregularities in mitosis and especially in meiosis, which led to numerical chromosome alterations, aneuploid and euploid, and also induced structural chomosome changes. Progeny of treated plants included structural and numerical variants of various kinds, and additional new variants were obtained by crossing the extreme variants and by further breed-

ing. Chiasma formations between normal and structurally changed chromosomes, between partially homologous unchanged, and probably also between nonhomologous ones, conditioned secondary structural changes and variations. Certain variants are considered in connection with the origin of *N. tabacum* and its varieties, and the roles of abnormal temperatures and of other factors inducing hereditary variations in nature are discussed. An extensive bibliography is appended.

An interesting Texas cucurbit—Cucurbita pepo L. var. ovifera Alef. (C. texana Gray), A. T. Erwin. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 12 (1938), No. 2, pp. 253–261, pls. 3*).—The author presents evidence that *C. pepo* existed in the southwestern United States ages ago, as shown by archeological remains, and that the Texas form of the same species has survived in the wild over a considerable range in this same region for over a century. It is believed that the preponderance of present evidence favors accepting *C. pepo ovifera* as the prototype of our cultivated forms of this species rather than, as hitherto some have supposed, an escape from cultivation.

Tetraploidy and octoploidy induced by colchicine in diploid Petunia, A. Levan (*Hereditas, 25 (1939), No. 2, pp. 109–131, figs. 8*).—By soaking seeds in aqueous solutions of colchicine or treating seedlings with colchicine agar, a considerable number of tetraploids, together with single octoploids, are reported to have been originated, the induced changes being somewhat more extreme by the first method. Preliminary data are presented concerning the comparative morphology of diploid, tetraploid, and octoploid petunias, and their interrelationships in general viability are discussed. The cytology of a large number of treated and control plants was studied, the artificial polyploids showing a similar chromosome morphology and a similar course of meiosis to the spontaneous tetraploids. Two types of deviation in meiotic behavior are described. Dissimilarities in reaction to colchicine among various plants are discussed, and as a contrast to the behavior of *Petunia* some experiments with *Beta* are briefly noted and possible causes of the differences obtained are considered. Sixteen references are included.

Tetraploid sugar beets from colchicine treatments, J. Rasmusson and A. Levan (*Hereditas, 25 (1939), No. 2, pp. 97–102, figs. 3*).—This is a preliminary report on the successful production of tetraploid sugar beets by use of colchicine.

Unfruitfulness in the tomato caused by male sterility, J. W. and M. Lesley. (Calif. Citrus Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58 (1939), No. 8, pp. 621–630, figs. 2*).—Stating that, because of the normal self-fertility in the tomato, pollen sterility may be a serious crop matter, the authors discuss the results of studies with partially unfruitful plants that occurred in an F_3 population from a simple trisomic F_2 having an extra *H*(IV) chromosome. The pollen produced by the male-sterile plant was nearly normal in amount, but its development was arrested. A small proportion, perhaps from 2 to 3 percent, of fully developed pollen grains occurred, but apparently did not function successfully. Male sterility was completely recessive and depended on at least two recessive genes, ms_1 and ms_2, both of which were necessary for male sterility. An apparent 7:1 ratio in one backcross suggested that parents may have differed in a third pair of male-sterility genes, the third dominant allel being introduced by male-fertile parents. The authors suggest that some of the unfruitful plants that occur in commercial tomato varieties may be male-sterile segregates from the selfing of fruitful and apparently normal heterozygous plants.

[Papers on animal genetics, physiology of reproduction, and lactation] (*Amer. Soc. Anim. Prod. Proc., 31 (1938), pp. 13–40, 54–57, 67–72, 77–83, 103–*

107, 141–146, 223–259, 272–310, figs. 17).—Brief reports were presented on the following subjects before the American Society of Animal Production (E. S. R., 79, p. 318): The Endocrine System—Hormones Elaborated, Their Nature, Interrelations, and General Mode of Action, by L. E. Casida (pp. 13–17) (Wis. Expt. Sta.); Interrelations Between Endocrines, Metabolism, and Productive Efficiencies in Farm Animals, by S. Brody (pp. 17–19) (Mo. Sta.); The Endocrine Control of Growth, by H. H. Cole (pp. 20–26) (Univ. Calif.); Endocrines and Male Reproductive Behavior, by C. R. Moore (pp. 26–29); The Relation of Endocrines to Female Reproduction and Lactation, by C. W. Turner (pp. 29–33) (Mo. Sta.); Combating Sterility With Hormones, by S. A. Asdell (pp. 33, 34) (Cornell Univ.); The Importance of Endocrinology to the Animal Husbandman, by G. H. Hart (pp. 35–40) (Univ. Calif.); Estrus, Ovulation, and Artificial Insemination in Cattle, by G. M. Werner, L. E. Casida, and I. W. Rupel (pp. 54–57) (Univ. Wis.); Nicking in Dairy Cattle, by E. E. Heizer, M. C. Hervey, G. R. Barrett, and G. W. Brandt (pp. 67–72) (Ohio State Univ.); The Accuracy of Measurements and Scores of Draft Horses, by R. W. Phillips, E. B. Krantz, and W. V. Lambert (pp. 77–83) (U. S. D. A.); A Comparison of Several Methods of Measuring Performance in Beef Cattle, by W. H. Black and B. Knapp, Jr. (pp. 103–107) (U. S. D. A.); A Study of Two Methods for Scoring Certain Characters in Swine, by H. O. Hetzer and R. W. Phillips (pp. 141–146) (U. S. D. A.); Conference on Artificial Insemination, by R. W. Phillips and J. C. Miller (pp. 223–228); Variations in Estrus and Ovulation in the Mare and Breeding Results, by F. N. Andrews and F. F. McKenzie (pp. 228–232) (Mo. Sta., Mont. State Col., and U. S. D. A.); Artificial Insemination of Horses and Jennets for Horse, Mule, and Jack-Stock Production—A Preliminary Report, by V. R. Berliner, F. E. Cowart, R. H. Means, and J. B. Wright (pp. 233–237) (Miss. Sta.); Preservation of Fertilising Capacity of Horse Semen, by A. Walton (pp. 238–241); Problems in Long-Range Insemination of Livestock, by R. G. Schott, E. M. Gildow, and R. W. Phillips (pp. 241–246) (U. S. D. A. and Idaho Sta.); Some Factors Affecting Artificial Insemination in Cattle, by H. P. Davis (pp. 246–253) (Nebr. Sta.); Criteria of Fertility in the Bull.—I, The Exhaustion Test, by A. Walton and J. Edwards (pp. 254–259); Relation of Regression to Selection, by W. W. Yapp (pp. 272–277) (Univ. Ill.); The Relationship of Environment to Selection, by L. M. Winters (pp. 278–284) (Univ. Minn.); Some Observations on the Response of Purebred *Bos taurus* and *Bos indicus* Cattle and Their Crossbred Types to Certain Conditions of the Environment, by A. O. Rhoad (pp. 284–295) (U. S. D. A.); Oestrus Cycle of Jennets and Sperm Production of Jacks, by V. R. Berliner, E. W. Sheets, R. H. Means, and F. E. Cowart (pp. 295–298) (Miss. Sta.); A Preliminary Study of the Relation Between the Fleece Characteristics of Weanling and Yearling Range Sheep, by W. V. Lambert, J. I. Hardy, and R. G. Schott (pp. 298–303) (U. S. D. A.); Sex Ratios of Fetal Calves, by A. B. Chapman, L. E. Casida, and A. Cote (pp. 303, 304) (Wis. Sta.); Inbred Sows vs. Inbred Boars in Outcrosses, by O. S. Willham (pp. 304–307) (Okla. Sta.); and Reproductive Capacity of Rambouillet Ram Lambs as Indicated by Semen Tests, by C. E. Terrill (pp. 308–310) (U. S. D. A.).

Blood value of cross-breeds between the wild *Ovis polii karelini* Sew. and the domestic sheep, V. I. Patrushev *(Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 21 (1938), No. 1–2, pp. 63–67).*—Study of the blood factors of 345 sheep, including hybrids and backcrosses between the wild *O. polii karelini* and the New-Caucasian Merino, Precoce, and Kurdyuk, showed that in glutathione concentration, dry residue and specific gravity of the blood, and resistance of erythrocytes to solution the hybrids excelled the purebreds. These conditions seemed to be controlled by multiple factors. Crossbred lambs

between the wild *O. polii karelini* and the Merino were larger at birth than the Merinos or other crossbreds. Triple hybrids (*O. polii karelini* × Merino × Precoce) showed more rapid growth and were larger than the first crosses at 18 mo.

Investigations on twinning in German Improved sheep (Württemberger) with special reference to the Hohenheim strains [trans. title], K. Biegert (*Ztschr. Tierzücht. u. Züchtungsbiol., 42 (1938), No. 2, pp. 215–258, figs. 21*).—Data are reported on the percentages of twins born in 13 Württemberger flocks from 1922 to 1936. Variations in the climatic conditions were noted but were not definitely associated with twinning. The tendency to twinning increased with the age of the ewes, and variations in twinning were associated with the sires and dams. The tendency seemed to be hereditary.

[Investigations in poultry genetics by the Massachusetts Station], F. A. Hays and R. Sanborn (*Massachusetts Sta. Bul. 355 (1939), pp. 91, 92, 93*).—Results are briefly presented which show differences in the amount of broodiness, rate of production, mortality, and early feathering in selected strains of Rhode Island Reds.

Studies on sauropsid chromosomes.—V, The karyotypes of the quail and the duck, different from those reported by previous authors, K. Oguma (*Annot. Zool. Jap., 17 (1938), No. 3–4, pp. 612–622, figs. 17*).—Continuing these papers, in part previously noted (E. S. R., 58, p. 218), reports are given on cytological studies of adult testes from the quail and duck and embryonic testes and ovaries from the duck. It was observed that the diploid chromosome numbers in ♂♂ were 78 and 80, respectively. The ♀ duck had 79.

The origin of the total albino variety of the shell parakeet, H. Butz and W. Schnelle (*Ztschr. Tierzücht. u. Züchtungsbiol., 42 (1938), No. 2, pp. 259–268*).—An explanation of albinism due to a sex-linked recessive gene.

Internal secretions in reproduction, E. Allen (In *Science in Progress*, edited by G. A. Baitsell. *New Haven, Conn.: Yale Univ. Press; London: Oxford Univ. Press, 1939, pp. 180–209, figs. 18*).—A summary of the endocrines related to reproduction and lactation is given.

The ovarian condition and sexual behavior in the female guinea pig, W. C. Young, E. W. Dempsey, H. I. Myers, and C. W. Hagquist (*Amer. Jour. Anat., 63 (1938), No. 3, pp. 457–487, pls. 2*).—Studies of the relation of the condition of the ovaries to sexual behavior in 17 immature and 207 sexually mature guinea pigs showed much variation, but important factors in the ovarian condition seemed to be the time required to complete ovulation; temporary or permanent variation in individual sensitivity to oestrin-progesterone, or other hormones; and action or reaction and number of ruptured follicles. In general in the guinea pig the ovary reflects the stimuli from the hypophysis, and its action is limited by the responsiveness of the somatic tissues on which its secretions act. Following removal of one ovary, the number of maturing follicles remaining in the other ovary was doubled.

Cellular changes in the anterior hypophysis during the reproductive cycle in the female guinea pig, C. W. Hagquist (*Anat. Rec., 72 (1938), No. 2, pp. 211–229, figs. 5*).—Variations in the percentages of the different cell types found in the hypophysis of ♀ guinea pigs at eight stages of the reproductive cycle commencing with the copulatory stage were not considered statistically significant. However, the Golgi apparatus hypertrophies during the first half and becomes fragmented during the second half of the cycle. Changes in the concentration of the mitochondria were associated with heat production. Pituitary conditions were not associated with the number and stage of follicular development.

A quantitative study of the influence of the ovarian hormones on hyperplasia by mitosis in the rabbit uterus in early pregnancy, W. D. CRANDALL (*Anat. Rec.*, *72 (1938), No. 2, pp. 195–210, figs. 2*).—Hyperplasia of the circular muscle cells and associated connective tissue cells was found to occur by mitosis in the uterus of the rabbit during the first week of pregnancy. Studies of the effects of subsequent ovariectomy and the administration of oestrin or progesterone suggested that the hyperplasia is induced by the action of these hormones and that mitosis in the muscle cells was induced by progesterone and to a lesser extent by oestrin, whereas mitosis of the connective tissue cells resulted mainly from oestrin alone.

The manifold effects of prolonged administration of sex hormones to female rats, V. KORENCHEVSKY, K. HALL, and R. BURBANK (*Biochem. Jour.*, *33 (1939), No. 3, pp. 372–380*).—Studies of the effects on the organs of spayed rats of injections for about 3.5 mo. of androsterone, transdehydroandrosterone, testosterone propionate, and oestradiol dipropionate, alone, or each of the ♂ hormones in combination with the ♀ hormone and with progesterone showed that the vagina could be completely restored but the uterus not entirely to normal weight by the administration of oestradiol dipropionate. Testosterone propionate alone produced pronounced progestational changes in the uterus and less strong ones in the vagina, whereas the other androgens had little effect on the uterus but the vagina and preputial glands were hypertrophied. Cooperative action between the ♂ and ♀ hormones in their action on the uterus was noted, but the addition of progesterone to the combination of testosterone and oestradiol inhibited the uterine weight increase. The influence of the hormones on other organs was observed. The effects of testosterone propionate on normal rats were similar to those observed in the ovariectomized ♀♀.

Sperm formation and growth of accessory reproductive organs in hypophysectomized ground squirrels in response to substances from blood and human urine, L. J. WELLS and M. D. OVERHOLSER. (Univ. Mo.). (*Anat. Rec.*, *72 (1938), No. 2, pp. 231–247, pls. 2, fig. 1*).—Treatment of hypophysectomized immature and mature ♂ ground squirrels with extracts of human ♂ urine, pregnant-mare serum, and pregnancy urine induced the formation of spermatozoa in the epididymis in the nonbreeding season. Accessory reproductive organs were stimulated, as judged by their size and histological characteristics.

Preliminary extraction of gonadotrophic principle from pregnant mare serum, H. RINDERKNECHT, R. L. NOBLE, and P. C. WILLIAMS (*Biochem. Jour.*, *33 (1939), No. 3, pp. 381–384, figs. 2*).—A method for purification of the gonadotropic hormone in pregnant-mare serum by precipitation with salicylsulfonic acid and subsequent fractionation and purification is described. The resulting water-soluble white powder represents about a thousandfold purification of the solids in the original serum.

The action of the dipropionate and benzoate-butyrate of oestradiol on ovariectomized rats, V. KORENCHEVSKY, R. BURBANK, and K. HALL (*Biochem. Jour.*, *33 (1939), No. 3, pp. 366–371*).—Comparison of the effects of these substances in three weekly injections of 18 and 90 μg. into spayed rats showed that the vagina and clitoris were more than restored to normal weight for a period as long as 106 days after treatment with the benzoate-butyrate ceased. The weight of the uterus was increased but was not restored to normal weight except in the group treated for 19 weeks with 300 μg. of benzoate per week. During the long-continued effects after injections ceased, the structure of the vagina was changed from the oestrous to the progestational form, probably from the cooperative action of the small amount of oestrogenic hormone with progesterone from the adrenals. The effects of the treatment on other organs and tissues were also noted.

Stability of testis hormone, D. R. McCullagh (*Endocrinology, 24 (1939), No. 3, pp. 326–330*).—Studies were made of the capon comb development induced by testosterone and testis extracts before and after boiling. Testosterone was inactivated very slowly by boiling with 5 percent sulfuric acid for as long as 5 hr. Boiling the extracts for 15 min. with acid had variable effects. These results are taken to indicate the presence of more than one androgen in the testicular extracts.

Progesterone is androgenic, R. R. Greene, M. W. Burrill, and A. C. Ivy (*Endocrinology, 24 (1939), No. 3, pp. 351–357, figs. 2*).—Progesterone and progestin were both found to stimulate growth of the prostates and to a lesser extent the seminal vesicles of immature normal and immature and adult castrated ♂ rats. Progesterone also stimulated growth in the size of the clitoris of mature ♀♀. Thus this substance seemed to have androgenic properties.

The effect of temperature on the response of Bantam capons to androsterone, A. M. Hain (*Quart. Jour. Expt. Physiol. and Cog. Med. Sci., 28 (1938), No. 4, pp. 353–355*).—Comb growth as determined by increase in the length and height in capon Bantams was found to be related to the dose of androsterone administered on 5 successive days. With 0.25 mg. of androsterone the average growth at a temperature of from 40° to 48° F. was 3.4 mm. as compared with 10 mm. with doses of 1.5 mg. at the same temperature. Temperature also had an important influence, as doses of 0.5 mg. of androsterone caused comb growth of 5.75, 3.3, and about 2.5 mm. when the temperatures of the house ranged from 40° to 48°, 50° to 64°, and 58° to 74°, respectively.

Comb atrophy after adult castration (Bantam cocks), A. M. Hain (*Quart. Jour. Expt. Physiol. and Cog. Med. Sci., 28 (1938), No. 4, pp. 349–352, figs. 3*).—Data are reported on the regression in height and length of the combs of 100 Bantams following adult castration. Regression in the length was close to 40 percent, but the regression in height varied with the initial size. The heights to which the combs of adults regressed were much greater than the heights of the combs of immature castrates.

Influence of parity on litter size as well as relation of litter size and parity to mortality in white mice during the suckling period [trans. title], S. Wanke (*Ztschr. Tierzücht. u. Züchtungsbiol., 42 (1938), No. 2, pp. 269–280*).—Study of 7,916 litters of white mice showed that second litters were largest and experienced the lowest mortality during suckling.

Blood value of Yaroslavl cattle in correlation with body weight and yield of milk, V. I. Patrushev (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 21 (1938), No. 1–2, pp. 89–93, figs. 3*).—Age and sex differences in the blood analyses of Yaroslav cattle were noted, but on the average greater body weight was associated with higher resistance of the red cells to solution, higher concentrations of glutathione, and higher specific gravity and dry residue in the blood characteristics. The catalase activity and resistance of erythrocytes were associated with milk yield.

The influence of domestication of silver foxes on their anatomical characteristics [trans. title], G. Müller (*Ztschr. Tierzücht. u. Züchtungsbiol., 42 (1938), No. 2, pp. 281–302, figs. 10*).—The weights and measurements of various organs and parts of 58 silver and red foxes are presented and discussed.

Prenatal and postnatal sex ratio in sheep, W. L. Henning. (Pa. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 8, pp. 565–580, fig. 1*).—From 1923 to 1937 there were 875♂ and 867 ♀ lambs born in the station flocks of all breeds, a sex ratio of 50.2±1.20 percent ♂♂. Sex ratios of Southdown lambs registered confirmed the assumption that only a portion of the rams are recorded, but there seemed to be a greater tendency to select rams born as twins

than as singles. Sex ratios of 972 fetuses of various ages from packing house and other material showed 50.9±1.60 percent ♂♂. Timed fetuses and fetuses of different lengths and weights did not show significant differences in the sex ratios. There was greater mortality of both sexes in the larger litters. Growth curves for weight and length were calculated from data on 38 fetuses of known intra-uterine age.

Contribution to the knowledge of sexual reproduction in Karakul sheep in reference to artificial insemination [trans. title], U. HÖCKER (*Kühn Arch., 47 (1938), pp. 27–77, figs. 2*).—Concerning the fertility of ewes and rams, studies were made of the motility of semen from different ♂♂ by the use of recommended methods of artificial insemination with collection of semen in an artificial vagina and preservation of it at from 6° to 10° C. A total of 54.2 percent of the artificially inseminated ewes lambed as compared with 31.8 percent following normal matings.

The possibility of early sex determination in fowls [trans. title], J. FORSTHOFF (*Ztschr. Tierzücht. u. Züchtungsbiol., 41 (1938), No. 1, pp. 28–89*).—A review is given of early sex determination in fowls and the methods whereby sex may be identified at hatching by the use of sex-linked genes in suitable crosses.

FIELD CROPS

Productive farm crops, E. G. MONTGOMERY (*Chicago: J. B. Lippincott Co., 1938, 5. ed., rev., pp. IX+521, [pl. 1], figs. 203*).—A fifth and revised edition of a book noted earlier (E. S. R., 60, p. 635).

[Agronomic experiments in Connecticut] (*Connecticut [New Haven] Sta. Bul. 421 (1939), pp. 38, 39, 42, 43–45, 46*).—Progress results are again (E. S. R., 79, p. 321) noted briefly from breeding work with corn and corn hybrids, fertilizer tests with potatoes and sweetpotatoes, and tobacco investigations at Windsor (see p. 509), including studies on the role of yeasts in tobacco fermentation.

[Field crops work in Kentucky] (*Kentucky Sta. Rpt. 1938, pt. 1, pp. 19, 21, 25, 26, 35–37, 38, 39–44, 50, 52, 53, 55*).—Research with field crops (E. S. R., 79, p. 471) reported on again from the station and substation included variety tests with corn, wheat, potatoes, alfalfa, and red clover; breeding work with corn (and hybrids), wheat, tobacco for low nicotine, and bluegrass; rotation, fertilizer, topping and suckering, and curing experiments with tobacco; nitrate level in soil under Burley tobacco and effects on growth; fertilizer and variety tests with sorgo for sirup; response of wheat, clover, tobacco, and corn to liming; fertilized and limed crop rotations; studies of the relation of variety, starch storage and utilization, and soil productivity to red clover failure; determinations of the phosphorus contents of corn, wheat, buckwheat, pasture herbage, and other variously treated crops; and pasture experiments.

[Field crops experiments in Massachusetts], W. S. EISENMENGER, K. J. KUCINSKI, W. G. COLBY, R. W. DONALDSON, L. S. DICKINSON, H. M. YEGIAN, and C. E. CROSS. (Partly coop. U. S. D. A.). (*Massachusetts Sta. Bul. 355 (1939), pp. 10–12, 17–19, 20, 41–43*).—Investigations for which results are again (E. S. R., 79, p. 471) reported briefly included variety trials with potatoes and alfalfa; effects on yield and quality of tobacco due to several spacings, to different treatments to old hay sod preceding tobacco, and to the influence of different weeds, crops, and vegetables, especially as to lignin content, when preceding tobacco (E. S. R., 79, p. 327); comparisons of hay seeding mixtures and effects of potash top dressing on meadows; influence of time of cutting on yields and of the use of potash in preventing winter-killing of alfalfa; pasture experiments, including tillage, fertilizer, and reseeding; use of calcium cyanamide to control

crabgrass in Kentucky bluegrass lawns; and chemical control of cranberry bog weeds.

[Field crop experiments at the Puerto Rico College Station], A. Roque, J. Adsuar, J. Pastor Rodríguez, F. Méndez, L. A. Serrano, C. J. Clavell, F. Chardón, P. Richardson Kuntz, E. Molinary Salés, F. J. Juliá, and A. Riollano (*Puerto Rico Col. Sta. Rpt. 1938, pp. 46–48, 64, 66–71, 73–75, 76, 77, 78–80, 81, 83, 85, fig. 1*).—Experimentation with field crops (E. S. R., 79, p. 618) reported on from the station and the Isabela Substation included variety, uniformity, irrigation, fertilizer, soil reaction, trash disposal, and green manuring (*Crotalaria striata*) tests, all with sugarcane; forage production of variously fertilized grasses on hillsides and lowlands; fertilizer tests with corn, beans, alfalfa, and potatoes; breeding work with corn, cotton, beans, tobacco, and sugarcane; and variety trials with tobacco, sweetpotatoes, soybeans, beans, legumes for cover crops and green manure, cassava, yams, and yautias.

[Field crops investigations in Wisconsin, 1937–38]. (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 443 (1939), pp. 3–5, 6, 7, 8, 43, 44, 58–77, figs. 7*).—Progress reports are made again (E. S. R., 79, p. 618) from agronomic research at the station and substations, comprising curing by artificial heat and fertilizer and rotation experiments, both with tobacco, by W. B. Ogden and J. Johnson; comparative trials of Chippewa, Sebago, and other potato varieties, by G. H. Rieman; time of cutting tests with alfalfa, by E. M. Searls, with feeding tests with dairy heifers on the several cuttings in cooperation with G. Bohstedt, I. W. Rupel, and B. H. Roche; effects of plowed under combine grain straw on the following crops, and seeding, cultural, fertilizer, and management practices for alfalfa in the Hancock area, both by A. R. Albert; use of the cultipacker seeder in improving stands of meadows, by H. L. Ahlgren, O. S. Aamodt, and F. W. Duffee; breeding of improved varieties of Sudan grass, particularly for reduced HCN content, by Ahlgren, P. Hogg, and Aamodt; comparative resistance of domestic ryegrass and timothy to Wisconsin winters, by Ahlgren and Aamodt; yields of foreign v. American and Canadian red clover, by Aamodt and J. H. Torrie; merits of sweetclover-alsike-timothy as a hay mixture in central Wisconsin, by E. J. Delwiche; research on seed formation in alfalfa (E. S. R., 80, p. 613), by R. A. Brink and D. C. Cooper; the value of white clover in pasture and its response to culture, fertilizers, and grazing, by Ahlgren, F. W. Tinney, and Aamodt; response of bluegrass pasture to rotational grazing and nitrogen fertilization, by Aamodt, Ahlgren, Rupel, Bohstedt, E. J. Graul, and Tinney; varieties of oats, barley, spring and winter wheat, and rye outstanding in tests in northern and central Wisconsin and date of seeding tests with winter wheat and other small grains, by Delwiche, A. L. Bibby, D. H. Holt, E. Hirsch, and W. Carlson; breeding work with barley, by H. L. and R. G. Shands, with oats by Shands and Torrie, and with winter and spring wheat, all for yield and resistance to disease and other qualities, and with potatoes, by T. C. Allen and Reiman, for resistance to hopperburn; corn hybrid investigations, by N. P. Neal, A. H. Wright, Delwiche, and A. M. Strommen, concerned with the relative merits of Wisconsin and introduced hybrids and progress of the use of hybrid corn in the State, and the development of hybrid corn for northern Wisconsin; methods of handling seed corn, including improvement in a slatted floor seed corn drier, development of a seed corn grader, and studies of effects of storage conditions, especially moisture content and chemical dusts, on germination, by Wright and Duffee.

[Experiments with field crops in Wyoming]. (Partly coop. U. S. D. A.). (*Wyoming Sta. Rpt. 1938, pp. 3–5, 6, 29, 30, 31, 31–33, 34–38, 39, 40*).—Agronomic experiments (E. S. R., 79, p. 43) at the station and substations, reported on

briefly, included variety tests with winter and spring wheat, oats, barley, flax, corn, potatoes, alfalfa for yield and wilt resistance, field peas and miscellaneous forage grasses and mixtures; dry land v. irrigated potato seed and spray treatments and tuber index tests with potatoes; cultural (including planting) experiments with winter and spring wheat, barley, oats, corn, potatoes, sugar beets, crested wheatgrass, bromegrass, and alfalfa; fertilizer trials with potatoes (phosphate), alfalfa, and sugar beets; ordinary, manured and fertilized, and pastured crop rotations; methods of preparing seedbeds for different crops; trials of alfalfa in mixtures with grasses; response of alfalfa to cultivation and manure; pasture studies; and control of quackgrass.

Diurnal cycle of heat resistance in plants, H. H. Laude. (Kans. Expt. Sta.). (*Science, 89 (1939), No. 2320, pp. 556, 557*).—A daily cycle of heat resistance in plants was observed in corn, wheat, barley, sorghum, and alfalfa. The daily maximum resistance to heat was attained by plants at about mid-day and continued during afternoon. The minimum resistance prevailed early in the morning. Resistance to heat increased when plants were exposed to light and decreased in absence of light. One hour of light following normal darkness of night was long enough for plants to acquire a measurable and, in some cases, marked resistance to heat. Ordinarily plants reached their daily maximum heat resistance within 4 hr. after exposure to daylight following normal night. Plants exposed to electric light during the night were more resistant to heat in early morning than those kept in the dark during the night. Loss of heat resistance in plants when exposed to darkness was slower than gain of resistance in the presence of light.

Some effects of temperature on the growth and chemical composition of certain pasture grasses, E. M. Brown. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul. 299 (1939), pp. 76, figs. 33*).—Established cultures of Kentucky and Canada bluegrasses, orchard grass, and Bermuda grass were grown in thermoregulated growth chambers, and effects of temperature treatments (40°, 50°, 60°, 70°, 80°, 90°, and 100° F.) on growth and chemical composition were determined for periods approximating 8 weeks.

The bluegrasses and orchard grass made considerable growth at 40°, while Bermuda grass made no growth at 40° and very little at 50°. Optimum temperatures for herbage production were between 80° and 90° for the bluegrasses and 70° for orchard grass. Bermuda grass made more herbage at 100° than lower temperatures. For root and rhizome production the optimum was 60° for Kentucky bluegrass and 50° for Canada bluegrass. Orchard grass made maximum root growth at 70°, while root growth by Bermuda grass increased with each 10° rise to 100°. The bluegrasses and orchard grass especially were severely injured by a continuous air and soil temperature of 100°, largely due to the high soil temperature. Rhizomes of Kentucky bluegrass tended to remain below the soil line at 80° or lower and those of Canada bluegrass at 50° or lower. Higher temperatures stimulated emergence of growing points of rhizomes above the soil line.

In the bluegrasses and orchard grass the percentage content of nitrogen-free extract declined but increased in Bermuda grass with rising temperature. In all four grasses the crude fiber content rose with the temperature from 40° to 60° and changed little with further rises in temperature. The crude protein percentage declined slightly in the bluegrasses and orchard grass as temperature rose from 40° to 60° and then increased slightly as the temperature went above optimum for growth. Crude protein content in Bermuda grass was much greater at 50° than at 60°. When plants were exposed to variable temperature effects of high day temperature appeared to be counter-

balanced by low night temperature as to the chemical composition of the plant. This was also true for the growth of orchard grass, but the other three grasses responded to diurnal temperature variations as high day temperature exerted more influence than low night temperature on growth.

A review of literature on effects of temperature on the growth and chemical composition of plants includes 28 titles.

The utilization of water by alfalfa (Medicago sativa) and by bluegrass (Poa pratensis) in relation to managerial treatments, V. G. Sprague and L. F. Graber. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 12, pp. 986–997, figs. 2*).—Water use by alfalfa and Kentucky bluegrass was compared in the greenhouse with optimum moisture conditions and under frequent and deferred cutting treatments, with and without nitrogen fertilization. The daily rate of water use was low in vegetative growth stages but increased directly with the rate of top growth accumulation, was very high with plants approaching maturity, and was low and quite constant with weekly clippings which maintained a vegetative state of growth. Weekly defoliations of well-established, high-reserve alfalfa greatly reduced the total water used and water requirement during the first 65 days of growth. Such defoliations also reduced the total water used by bluegrass, but water needs were not affected greatly.

After-effects of nine weekly defoliations, which lowered the food reserves of alfalfa moderately and those of closely clipped bluegrass very severely, were evident in markedly reduced subsequent top growth and total amount of water used to produce it, and increases in amount needed to produce one unit of dry top growth. The tendency was noted for nitrogen fertilizations to increase total water used but to decrease water needed per unit of dry matter produced. In periods pending drought, early cutting of alfalfa and close early grazing of bluegrass would tend to maintain a greater moisture reserve in the soil for subsequent growth than would prevail with deferred grazing or cutting. See also an earlier note (E. S. R., 79, p. 187).

The effect of different fertilizer ratios on Colonial, creeping, and velvet bent grasses, J. A. DeFrance. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 773–780, figs. 2*).—Study of the effects of different fertilizer ratios on three bentgrasses, 1933–37, showed that the most vigorous growth was obtained from fertilizers high in nitrogen and phosphorus, with no increase in vigor from addition of potassium. Varying amounts of nitrogen influenced color ratings the most, addition of phosphorus and potassium having little beneficial effect. Low nitrogen, in general, developed the finest textured turf, the reverse from the highest ratings of color, density, and vigor from use of high nitrogen. The densest turf resulted from high nitrogen and the thinnest from the low nitrogen. High phosphorus plats of Piper and Rhode Island bent surpassed all but the high nitrogen plats. Nitrogen appeared to be mainly responsible for density, with phosphorus assisting to some extent.

Although the high nitrogen fertilizer gave the highest quality ratings for vigor, color, and density, the turf grew too rapidly and was too spongy for practical putting green conditions. While the low nitrogen plats had the highest rating of texture, they were more susceptible to invasion of clover and weeds, had a hard surface, and were more subject to drying out than were other plats. A complete mixture, as 10–6–4 or 10–12–4, with nitrogen from both organic and inorganic sources seemed best for general application as a top dressing fertilizer.

The high phosphorus and low nitrogen favored growth of clover, while high nitrogen discouraged the invasion of clover, crabgrass, and plantain. Broad-leaved plantain was the most troublesome weed other than crabgrass in the first 2 yr. Very few weeds of any kind appeared during the last 3 yr. Large brown

patch disease was least severe on the high potassium and low nitrogen plats. On Rhode Island and Washington bent, dollar spot was most severe on the low nitrogen and least severe on the high nitrogen plats. Piper velvet was 100 percent resistant to dollar spot.

Piper velvet bent was outstanding and appeared more satisfactory than Rhode Island Colonial bent or Washington creeping bent in quality ratings based on density, texture, and color and weed and disease resistance.

Growing grass under trees, H. B. Sprague. (N. J. Expt. Stas.). (*Shade Tree, 12 (1939), No. 4, pp. [2, 3]*).—Practical suggestions on species and cultural and fertilizer practices.

Studies on the nitrogen, phosphorus, and mineral requirements of alfalfa, A. W. Blair and A. L. Prince. (N. J. Expt. Stas.). (*Soil Sci., 47 (1939), No. 6, pp. 459–466*).—Alfalfa was grown 1935–38, inclusive, on $\frac{1}{40}$-acre plats of Sassafras loam that had received no phosphorus since 1924 and on plats receiving varying amounts of phosphorus annually. Potassium was applied uniformly to all plats, but nitrogen was limited to a small amount at seeding.

Yields from check plats averaged about the same as those receiving the highest amount of phosphorus. The hay tended slightly toward a higher percentage of phosphorus with increase in phosphorus applied, which did not influence the percentages of nitrogen, ash, CaO, and MgO in the hay. The percentage of CaO was from five to seven times as high as the percentage of MgO. Soil taken from the plats in 1932, 1935, and 1937 showed a tendency toward a slight increase in the total phosphorus content with increase in the amount applied. Profile samples from soil receiving the maximum phosphorus application showed slightly more phosphorus in the 6-in. layers down to 30 in. than soil receiving no phosphorus. Indications of a reservoir of phosphorus in the 42-in. layer amounting to from 10,000 to 12,500 lb. P_2O_5 per acre suggested an explanation for the failure of alfalfa to respond to phosphorus treatment. The results reported are for the experimental conditions and are not to be taken as endorsing the omission of phosphorus from alfalfa fertilizers.

Starch reserves in the roots of pastured alfalfa when grown alone and in mixtures, H. C. Rather and C. M. Harrison (*Michigan Sta. Quart. Bul., 21 (1939), No. 4, pp. 281–291, figs. 4*).—Certain of the problems involved in grazing alfalfa and alfalfa-grass mixtures were studied at Augusta by biweekly examination of alfalfa roots for starch reserves and by measuring ewe and lamb gains during the pasture season.

Alfalfa roots were lowest in starch reserves during the period of most active growth in the spring. The reserves became depleted with close grazing or following a close cutting. Alfalfa or alfalfa and smooth bromegrass in mixture returned far greater net gains per acre with sheep than did any native pasture plants when compared on a season-long grazing basis. Alfalfa and orchard grass mixture was poor because of difference in palatability of the plants and resulted in over-grazing and consequent death of the alfalfa. The difference in palatability of orchard and smooth bromegrasses could be judged by the condition of the alfalfa roots when orchard grass was unpalatable in realtion to bromegrass. Starch reserves in alfalfa roots previous to killing frosts were necessary to prevent carbohydrate starvation and subsequent winter-killing. Alfalfa, grown alone, stored starch in the roots much more readily than in mixture with grass.

Sheep gains were the largest in the first part of the grazing season when forage was succulent and produced much faster than a reasonable number of animals could graze it.

Curing and storage of alfalfa hay, E. R. Henson (*Iowa Sta. Res. Bul. 251 (1939), pp. 46, figs. 7*).—Results of experiments on methods of curing and

storing alfalfa hay are reported, with a review of literature on various aspects of these subjects embracing 78 titles.

Alfalfa hay cured more rapidly in the swath than in the windrow and faster in the windrow than when cocked. Hay one-fourth, one-half, or three-fourths cured in the swath prior to windrowing cured faster than hay windrowed at once, and the longer the hay remained in the swath the less time it required for curing. Cocking hay at once or after partial swath or windrow-curing delayed curing. Green hay in large cocks heated and lost its color, yet good quality hay was made by cocking after partial swath or windrow-curing. Turning average sized windrows with the rake in good curing weather was slightly detrimental, although turning large windrows or windrows wet by rain resulted in faster curing and a better quality of hay. Tedding hay had no advantages in these tests and was detrimental to the quality of the hay. Complete swath-curing resulted in the greatest loss of leaves, three-fourth and one-half swath-curing were next, while windrowing at once and one-fourth swath-curing followed by windrowing resulted in the least loss. Leaf loss in swath-curing hay was increased by the tedder, and turning of the windrow with the rake caused additional loss in windrow-cured hay.

The evidence and theories on heating of hay indicated that heating is due largely to chemical oxidation processes. These processes may be aided by respiration of the living cells in the plant up to 40°–45° C. and by the work of microorganisms from air temperatures to 70° in producing unstable, unsaturated compounds. Beyond this point the heating seemed due entirely to chemical processes. The presence of living cells in the stems and leaves of field-cured hay plants was shown.

Although hay placed in the mow ranged from 20 to 58.7 percent of moisture, the degree of heating was not directly proportional to moisture content. Hay with below 30 percent of moisture ordinarily may be considered safe from destructive or dangerous heating, and hay with less than 27 percent of moisture may be expected to retain its green color. The hay generally heats immediately on being mowed, then cools. In a second heating period which follows, the highest temperature usually is reached in from 8 to 10 days after mowing, after which the hay cools gradually. The amount of carbon dioxide present in the mow is deemed a fair indication of the degree of heating. Its accumulation in the presence of moist, hot material results in a transformation of the chlorophyll, accompanied by a change in color from green to brown. The green color of hay usually was destroyed when heating exceeded 50°. Clean, brown hay was formed by heating quickly to 55°, while prolonged heating at 50° or lower and later heating to above 55° resulted in dusty hay. In general, moldy, grayish-brown hay resulted from heating to between 40° and 50° during storage. Marked benefits from salting hay occurred in only one of six trials. No detrimental heating occurred when hay baled from the field with 23 percent of moisture was carefully stored.

Seed corn, M. T. Jenkins (*U. S. Dept. Agr., Farmers' Bul. 1822 (1939), pp. II+14, figs. 7*).—Intended primarily for the grower who maintains and endeavors to improve his locally adapted strain of open-pollinated corn by careful mass selection, this bulletin discusses choice of strains, improvement by mass and field selection, desirable plant characteristics, drying and winter storage of seed corn, germination tests, shelling and grading, prevention of injury by weevil or grain moths, and seed treatments. The publication supersedes Farmers' Bulletin 1175 (E. S. R., 44, p. 230). The breeding and development of corn hybrids is discussed elsewhere (E. S. R., 73, p. 36).

Sand culture of cotton plants, H. S. Olcott (*Science, 89 (1939), No. 2322, pp. 608, 609*).—Technic and a nutrient solution are described.

The effect of length of dormant period of seed Irish potatoes on yield, W. D. Kimbrough. (La. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 590–592*).—Respective average yields of No. 1 tubers grown, 1936–38, from northern grown (5 months' dormancy), Louisiana spring grown (9 mo.), and Louisiana fall grown (3 mo.) were for Katahdin 253.7, 220.5, and 173.3 bu.; Chippewa 218.3, 98.3, and 172; Houma 216.5, 110.1, and 115.9; and Triumph 199.5, 116.6, and 132.9 bu. Differences in sprouting and plant production are described. "For best results the dormant period should be long enough for the seed pieces to sprout rapidly when planted and the resultant plants to grow vigorously, but not long enough to produce multiple sprouting and stunted early maturing plants."

Effects of certain chemicals on apical dominance and rest period of Russet Burbank potatoes, G. W. Woodbury. (Idaho Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 601–604, fig. 1*).—Russet Burbank potatoes, treated with 4 percent aqueous solutions of potassium thiocyanate and thiourea, gave marked increases in sprout production. Evidence of shortening of the rest period, shown in earlier plantings, gradually disappeared until the normal termination of the rest period. Similar treatments to seed potatoes planted in the field resulted in increased number of stems and tubers per hill with a reduction in tuber size.

Fertilizer placement for potatoes, G. A. Cumings and G. V. C. Houghland. (Coop. Me., Mich., Ohio, N. J., [N. Y.] Cornell, and Va. Truck Expt. Stas. et al.). (*U. S. Dept. Agr., Tech. Bul. 669 (1939), pp. [2]+48, figs. 22*).—Experiments on the placement of fertilizer for potatoes (E. S. R., 76, p. 620; 81, p. 368) were made, 1931–37, in Aroostook County, Me., on Long Island, N. Y., in central New Jersey, on the eastern shore of Virginia, in northeastern Ohio, and in western Michigan. Fertilizers of both single- and double-strength grades were applied at the usual rates per acre and at other rates on typical potato soils of each district.

Fertilizer placed in a band at each side of the row usually produced the most rapid emergence of sprouts, most vigorous plant growth, and highest yields of primes and total yields. The preferable placement from a practical viewpoint was in a band 2 in. to each side of and on the lower level of the seed piece. Placement in a band at only one side of the row gave lower yields than a band at each side, and placement in a band immediately under, or above, or mixed with the soil around the seed piece usually resulted in delayed sprout emergence and reduction in yield. Single- and double-strength fertilizers supplying equivalent amounts of plant food gave similar results in actual potato yields and order of yields for various placements. Hill placement of fertilizer in short bands at each seed piece or hill had no advantage over comparable placements in continuous bands for seed spacings ranging from 12 to 16 in.

Storage treatment of soybeans with ethylene and carbon dioxide gas, C. H. Worsham, C. C. Waddell, and F. C. Vilbrandt (*Va. Engin. Expt. Sta. Bul. 36 (1939), pp. 34, figs. 15*).—Field run soybeans were treated in gas-tight silos through which mixtures of gases varying from 90 to 35 percent ethylene and from 10 to 65 percent carbon dioxide and air were recirculated to mature and stabilize the beans and to prevent peroxidase action, the latter being blamed with imparting the offensive odor and taste to the oil and meal. Whole beans treated for 24 and 48 hr. at 24°, 37°, and 50° C. were then rolled flat in a roll mill and expressed at 45°–60° in a hydraulic press at 10,000 lb. per square inch.

Oil from soybeans treated with ethylene and carbon dioxide mixture kept better than oil from those treated with air, remaining in good condition at

least 8 mo. after processing. Soybeans treated with a high concentration of ethylene gave oil with the best taste and odor, which declined very slightly with lower concentration of ethylene. Whole beans treated with ethylene at 24° gave the best oil, slightly superior to that from beans treated at 37°. Soybeans absorbed varying amounts of ethylene and carbon dioxide, depending on the gas concentration and the water removed. The rate of drying by air was considerably less than the drying rate when ethylene and carbon dioxide were used.

Studies of gaps in sugarcane rows and their effect upon yield under Louisiana conditions, G. Arceneaux and I. E. Stokes (*U. S. Dept. Agr. Cir. 521 (1939), pp. 20, figs. 5*).—Under conditions prevailing in southern Louisiana, the extent of gaps in sugarcane has been found to vary widely under different conditions and with different varieties. With the previously grown P. O. J. varieties, gaps in plant cane to as much as 30 to 40 percent of the row space were generally found. As a group the C. P. and Co. varieties currently grown showed much lower percentages of gaps than ordinarily were found in the P. O. J. canes, but under certain conditions even they have given very imperfect stands. In controlled experiments the loss in sugar yield resulting from a gap of a given length was shown to be considerably less than the normal production of sugar from the area the gap occupied, indicating that extensive compensatory growth is made by stools adjoining gaps. The actual value of the yield-reduction factor, i. e., the extent to which observed loss in sugar yield from a given gap approaches the normal production of the area involved, was found to depend on length of the gap, variety involved, and crop year. Short gaps reduced yields much less than equivalent space in longer gaps. Co. 281 showed the greatest relative yield loss from a given gappage and Co. 290 the least. The highest yield loss from gaps of plant-cane origin occurred in the plant-cane crop. A formula is suggested for estimating losses in yield of sugar per acre from gaps under specific conditions.

Further studies and technic in sweet potato breeding in Louisiana, J. C. Miller. (La. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 665–667*).—The technic described is based on experiments in the field and greenhouse during 1937 and 1938 on comparative methods of producing seed and seedling sweetpotatoes. The plants are carried over the winter in the greenhouse in from 10- to 12-in. pots and are moved to the field when danger of frost is past. Vines are trained fan-shape to a wire trellis about 7 ft. high. Plants are spaced about from 8 to 10 ft. apart in the row, and as soon as the vines become established in the field after moving, the plants are girdled by cutting the vine about two-thirds through about 6 in. from the ground. Uniform moisture supply is maintained at all times. When flowering occurs, a paper clip is placed late in the afternoon over the tip of the flowering bud to open the following day. Between 5 and 6 a. m. on the following morning the flower is emasculated and again closed by placing the clip over the tip. Crossings are made between 8 and 10 a. m. and the flowers tagged, and the clip replaced to prevent insect visitation. Seed capsules about two-thirds grown are covered with a small cloth bag until the seed is mature. The seed can be planted at once or stored. At planting time the seed should be treated for 20 min. with concentrated sulfuric acid to insure immediate germination and then washed thoroughly to remove all acid before planting.

Sweet potatoes: A summary of results of recent fertilizer experiments, R. Schmidt. (N. C. Expt. Sta.). (*Com. Fert., 58 (1939), No. 3, pp. 12–14*).—Review of recent fertilizer experiments with sweetpotatoes, largely noted earlier, showed plant food needs to differ extensively with locality.

The influence of nitrogen on grade and shape of Triumph sweetpotatoes in Mississippi, W. S. ANDERSON. (Miss. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 605–608*).—Increasing the nitrogen content of the fertilizer from 2 to 8 percent, with phosphorus held at 8 and potash at 4 percent, had no apparent effects on the proportions of the various grades nor on the shape of the roots of Triumph sweetpotatoes grown on different soils, 1935–38 (E. S. R., 79, p. 624), at Laurel, Miss.

Influence of lime and calcium chloride applications on growth and yield of sweetpotatoes, C. E. STEINBAUER and J. H. BEATTIE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 526–532*).—That as many as five heavy annual applications of lime to a soil originally quite acid may not significantly change color, or edible quality, but may slightly reduce yields of sweetpotatoes and markedly alter the soil reaction, was observed in tests, 1933–37, at Beltsville, Md. There were some indications that heavy applications of calcium chloride under the same conditions might increase the total yield and the proportion of large size sweetpotatoes in certain varieties without altering root color or edible quality. The results confirmed suggestions of others that sweetpotatoes are not very exacting as to soil acidity. Apparently they do best in a slightly to moderately acid soil, and yields may be somewhat decreased when the soil becomes neutral or alkaline.

Curing temperature in relation to storage quality of three varieties of sweet potatoes, H. B. CORDNER. (Okla. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 569–571*).—Roots of Nancy Hall sweetpotatoes shrank least in storage and kept satisfactorily following curing at as low as 70° F. Porto Rico roots kept best after curing at 92° with slightly greater storage losses following curing at 80°. The greatest storage losses were found in roots of the Maryland Golden, where it seemed imperative that a high curing temperature, about 90°, be used. Some attention evidently should be paid to relative humidity in the storage environment to avoid shriveling of roots of Maryland Golden.

Tobacco Substation at Windsor, report for 1938, P. J. ANDERSON, T. R. SWANBACK, and O. E. STREET (*Connecticut [New Haven] Sta. Bul. 422 (1939), pp. 49, figs. 22*).—Fertilizer and cultural investigations with cigar leaf tobacco (E. S. R., 79, p. 328) are reported on again, with accounts of the incidence and control of diseases and insects noted on pages 530 and 540 of this issue. The 1938 season was very disastrous for tobacco growers in New England. Excessive rains in June and July were followed by the hurricane of September 21 and flood which destroyed many full curing sheds and their contents. While the Tobacco Substation sustained no serious loss to buildings or equipment in either case, the heavy summer rains so reduced the yield and quality of the crop that most fertilizer and cultural field tests were either ruined or results were unreliable.

Losses of fertilizer constituents by leaching during an abnormally wet growing season, M. F. Morgan and O. E. Street (pp. 6–16).—Rainfall totaling 16.28 in. during the growing season of tobacco set May 26, 1938, was chiefly concentrated in four storm periods in June and July, aggregating 13.59 in. The resultant leaching of 8.3 in. of water from areas cropped to tobacco removed from 100 to 120 lb. of nitrogen per acre from the entire soil column. The tobacco crop could obtain only from 40 to 60 lb. of nitrogen per acre of the 160 lb. liberated during the growing season under favorable conditions on soils normally fertilized, or less than half the quantity ordinarily used by an average crop. The conditions were compared with those of 1934, which had favorable rainfall distribution, 7.95 in. from May 26 to August 4, about normal, except for a 2-week dry period in mid-July.

Lysimeter data showed that in the 1938 growing season, normally fertilized sandy loam in tobacco lost through leaching nitrogen approximating 100–150 lb. per acre, potash 50–75, lime 140–160, and magnesia 30–40 lb. Leaching losses were generally in inverse proportion to the weight of crop. Intensive leaching from normally cropped and fertilized soils during the 1938 growing season caused losses exceeding amounts removed by heavy fall rains following the normal 1934 season approximating nitrogen 85–130 lb. per acre, potash 20–35, lime 100–120, and magnesia 25–30 lb. Both dry weight of the tobacco crop on lysimeters and percentage composition as to nitrogen were materially less in 1938 in all corresponding nitrogen treatments. Nitrogen taken up by the crop was usually about one-half that of 1934. In 1934 nitrate nitrogen leaching was materially less than the nitrogen in the crop and the 1938 leaching greatly in excess. Evidently in 1934 the leaching represented nitrogen not used by the crop, while in 1938 the nitrogen in the crop was chiefly a residue from leaching.

Calcium deficiency, T. R. Swanback (pp. 16–18).—Calcium deficiency observed in numerous fields of tobacco was attributed to excessive leaching rains. Soil under calcium-starved plants did not show unusually low pH values (about 5.0), but was negative for replaceable calcium. Growers had supplied little or no liming materials either for 1938 or, in some cases, for many years. In restoring the calcium supply of depleted soil, not more than 500 lb. of agricultural lime should be applied the first year in order to prevent fixation of minor elements, and up to 500 lb. per acre land plaster also may be applied.

Value of top-dressing the growing crop with additional fertilizer (pp. 18, 19).—Profitable results in yield and grade of leaf followed top dressings of 114 lb. additional nitrogen per acre in three applications on a very light soil and 90 lb. in two applications on a medium heavy soil.

Further trials with soybean oil meal (pp. 19, 20).—The merits of soybean meal compared with cottonseed meal were shown again, although the crop was greatly reduced in yield and quality. Averages, 1936–38, showed a higher yield and grade index and 13 percent higher crop value for soybean meal.

Time of harvesting Havana Seed tobacco, IV (pp. 20–22)—Findings, 1935–38, indicated that Havana Seed tobacco should remain in the field at least 3 weeks after topping and often up to 4 for optimum yield and grading. The same rule probably should apply to Broadleaf.

Variations in chemical composition of leaves according to position on the stalk (pp. 22–26).—Leaf-by-leaf analysis of tobacco of the 1936 crop (Havana Seed No. 211) revealed a gradual and regular increase in the percentage of total nitrogen from bottom to top, with the uppermost leaves containing about three times as much as the lowest. Since this increase was accompanied by corresponding increase in nicotine, the upper, darker leaves make a "stronger" smoke and must be more thoroughly fermented before they are satisfactory for cigars. Calcium and magnesium, higher in the lowest leaves, decreased regularly in each successively higher leaf until the percentages at the top were about one-half that of the bottom leaves. Potash also tended to decrease toward the top of the plant but the trend was not so definite. Analysis of a composite sample of all of the midribs stripped from the same leaves showed the nitrogen and magnesia percentages about the same as the average for the leaf blades, the potash extremely high, showing heavy translocation from the blade to the midrib during curing, and the calcium as low as in the top leaves, showing no translocation of this element into the midribs.

Comparative development of two wheat varieties under varying moisture supply, J. W. Hopkins (*Canad. Jour. Res., 17 (1939), No. 4, Sect. C, pp. 87–96, figs. 4*).—When Lutescens and a cross of Reward × Caesium wheat were

grown in the greenhouse at four levels of soil moisture, significant effects of moisture supply on number, height, and weight of shoots, number of fertile heads, and weight, size, and nitrogen content of grain per plant and per shoot, differing in some cases in the two varieties, were shown. Relation between production of straw and fruiting parts per tiller seemed to be a varietal characteristic.

The response of quack grass to variations in height of cutting and rates of application of nitrogen, A. A. Johnson and S. T. Dexter. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 1, pp. 67–76, figs. 3*).—Quackgrass (E. S. R., 77, p. 332), grown in sand cultures in the greenhouse, with and without nitrogen, was cut weekly during 24 weeks to 1-, 3-, 6-, and 8-in. heights. At the end of the period the plus-nitrogen, close-cut cultures were dead, while the minus-nitrogen, close-cut grass was still alive and retained one-third of the original rhizome weight. Cutting cultures to 1 in. once a week was very injurious to plus-nitrogen plants but caused only slight injury to minus-nitrogen plants. Plus-nitrogen cultures cut to 3 in. lost in rhizome, root, and top weight, while in minus-nitrogen cultures rhizome weight increased and there was some loss of root weight and a large loss in top weight. Minus-nitrogen plants stored organic reserves in subterranean parts at a more severe cutting level than did plus-nitrogen plants. Minus-nitrogen cultures completely defoliated weekly produced only slightly less recovery growth than did plus-nitrogen cultures cut the same and yielded about twice as much as the next highest minus-nitrogen cutting treatment. These studies, if indicative of growth habits under field conditions, suggest that the fertilization of quackgrass should give an increase in top growth which could be used for hay or pasture, and that subsequent control measures on quackgrass thus fertilized should prove less difficult.

The relation of nutrients to toxicity of arsenic, borax, and chlorate in soils, A. S. Crafts. (U. S. D. A. and Calif. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], *58 (1939), No. 9, pp. 637–671, figs. 12*).—Current research on response to herbicides acting through the soil has shown that arsenic and boron toxicity are correlated with texture, while chlorate toxicity depends upon fertility. In experiments reported in this paper increasing the nutrient level lowered chlorate toxicity but did not affect arsenic and boron toxicity. In single-salt soil-culture series with a range of chlorate concentrations, cultures with added nitrate invariably showed decreased chlorate toxicity, and in fertile soil cultures chlorides and sulfates also reduced the toxicity. Cations in the culture medium did not affect chlorate toxicity except where ammonium ions were nitrified rapidly. The results obtained with soil cultures were confirmed with water-culture experiments. Absorption experiments with squash plants in water cultures indicated that little chlorate is absorbed from high-nitrate cultures, whereas more chlorate is absorbed and accumulated in the xylem sap in low-nitrate cultures.

"Since in most soils fertility, as denoted by the production of crops and roadside plants, is determined by nitrate concentration, plant growth may be used in predicting response to chlorate applications. In highly fertile soils costly experimentation with chlorates may be avoided and a program using carbon bisulfide or cultural or cropping practices substituted."

Summary of results of seed and legume inoculant inspection for 1938, J. G. Fiske (*New Jersey Stas. Bul. 658 (1938), pp. 22*).—Seed dealers in New Jersey from whom 2,211 official samples of crop and vegetable seed and seed mixtures were collected in 1938 are listed with compliances and violations, and crops, inoculation, and number of organisms are shown for 41 official samples of legume inoculants.

HORTICULTURE

[**Horticultural studies by the New Haven Station**] (*Connecticut* [*New Haven*] *Sta. Bul. 421 (1939), pp. 20, 38, 39–41*).—Included are brief progress statements on sand culture of seedling and mature plants and breeding of sweet corn, garden beets, peppers, tomatoes, and squash.

[**Horticultural studies by the Kentucky Station**] (*Kentucky Sta. Rpt. 1938, pt. 1, pp. 18, 19*).—Included are reports on variety tests of fruits and vegetables and on a comparison of strawy manure mulch with nitrate of soda for red raspberries.

[**Horticultural studies by the Massachusetts Station**], K. J. KUCINSKI, W. S. EISENMENGER, L. H. JONES, E. BENNETT, H. J. FRANKLIN, H. F. BERGMAN, W. E. TRURAN, H. E. WHITE, C. L. THAYER, R. M. KOON, G. GRAVES, H. S. TIFFANY, W. H. LACHMAN, C. B. SNYDER, R. E. YOUNG, P. W. DEMPSEY, A. P. TUTTLE, J. K. SHAW, L. SOUTHWICK, A. P. FRENCH, O. C. ROBERTS, J. S. BAILEY, F. SHAW, W. H. THIES, and R. A. VAN METER. (Partly coop. U. S. D. A.). (*Massachusetts Sta. Bul. 355 (1939), pp. 14, 28, 29, 35, 43, 44, 68–70, 77–91*).—Among investigations the progress of which is discussed are winter cover crops for onion fields; water culture of plants and methods of watering potted plants; effect of storage and processing on the carbohydrates of onions; effect of the September 1938 hurricane on cranberry bogs; flower and fruit production in the cranberry; breeding snapdragons for quality and disease resistance; effect of temperature on forcing lilies; effect of soil temperature, plant nutrients, soil reaction, and light on gardenias; propagation of the geranium; testing of packeted seeds; breeding and testing of perennial asters; propagation of clematis, delphinium, and beach plums; testing of hardy ornamentals; shape indexes of tomatoes; breeding of sweet corn and tomatoes; culture of the pepper; soil preparation for vegetables; asparagus culture and improvement; culture of trellised tomatoes; vegetable breeding and selection; influence of various clonal rootstocks on the apple; tree characters of fruit varieties; genetic composition of the peach; cultural and fertilizer requirements of apple trees; testing of fruit varieties; bud mutations in the apple; fruit-bud formation in the strawberry; nutritional requirements of the highbush blueberry and blueberry culture; pollination of the blueberry; causes of premature dropping of the McIntosh apple; and supplemental suncoloring of the apple.

[**Horticultural investigations by the Puerto Rico College Station**], F. MÉNDEZ, J. GUISCAFRÉ ARRILLAGA, L. A. GÓMEZ, E. MOLINARY SALÉS, A. RIOLLANO, L. A. SERRANO, J. SIMONS, and C. J. CLAVELL (*Puerto Rico Col. Sta. Rpt. 1938, pp. 54–61, 62, 63, 65, 66, 72, 77, 80, 82, 83–85, 85–89, 90, 91, 98, 107, figs. 6*).—Brief discussions are presented on the progress of studies of new dwarf coconuts, management of coffee plantations, fertilizers for coffee, propagation of coffee, effect of light intensity on the coffee plant, growth habits of coffee roots, the *Columnaris* variety, abscission of blooms in coffee, fertilizer needs and variety tests of garden peas, fertilizer requirements of the cucumber and pepper, citrus rootstocks, citrus fertilizers and irrigation, and varieties of bananas, citrus, mangoes, avocados, and papayas.

[**Horticultural studies by the Wisconsin Station**], L. LANGORD, R. H. ROBERTS, O. B. COMBS, J. G. MOORE, P. H. HORNBURG, F. L. MUSBACH, E. TRUOG, N. P. NEAL, R. H. ANDREW, and E. J. DELWICHE (*Wisconsin Sta. Bul. 443 (1939), pp. 9–13, 51–53, 77–81, fig. 1*).—Among studies discussed are those dealing with the soil management of orchards; variety testing of raspberries, muskmelons, lettuce, lima beans, tomatoes, and other vegetables; transplanting of tomatoes; fertilizer requirements of peas, beets, sweet corn, and tomatoes; pro-

duction of hybrid sweet corn varieties; and varietal and cultural trials of canning peas.

[Horticultural studies by the Wyoming Station] (*Wyoming Sta. Rpt. 1938, pp. 31, 33, 34, 38, 40*).—Brief mention is made of the results of variety trials with bush fruits and plums, of comparisons of fallowing and irrigation of gardens, and of the improvement of garden beans by plant selection.

Growing plants in nutrient solution, L. J. ALEXANDER, V. H. MORRIS, and H. C. YOUNG (*Ohio Sta. Spec. Cir. 56 (1939), pp. [1]+17, figs. 5*).—Beginning with a brief discussion upon the physiology of plant growth, general information is offered on methods of nutrient-solution culture, construction of the tanks, composition of the essential solutions, and some of the limitations and possibilities of this type of plant growing.

Containers for fruits and vegetables, L. C. CAREY (*U. S. Dept. Agr., Farmers' Bul. 1821 (1939), pp. 64, figs. 58*).—This publication, superseding those noted earlier (E. S. R., 52, p. 296; 61, p. 339), describes the types of containers most commonly used for shipping various commodities. Federal standards are in force for barrels and for several types of baskets and hampers, but most fruits and vegetables are said to be handled in containers such as crates, boxes, cartons, drums, and sacks for which no standards have been established. The existing Federal legislation is reviewed, and the importance and potential benefits of standardization are set forth.

Induced parthenocarpy of watermelon, cucumber, and pepper, C. WONG (Mich. State Col.). (*Science, 89 (1939), No. 2314, pp. 417, 418*).—Stating that natural parthenocarpy occurs very rarely in the National Pickling cucumber, the author reports that naphthalene acetic acid applied either in lanolin paste or in aqueous solution produced parthenocarpic fruits. In the watermelon, fruits were induced by treating the cut styles with lanolin paste or with aqueous solution. The resulting fruits were seedless and variable in shape, but of normal flavor. Satisfactory results were secured with the Harris Wonder pepper, both with lanolin paste and with aqueous solution.

A comparison of some asparagus varieties in California, H. A. JONES and G. C. HANNA. (U. S. D. A. and Calif. Expt. Sta.). (*Canner, 88 (1939), No. 19, pp. 18, 20, 21*).—In a 12-yr. test at Davis, Calif., significant differences in yield, size and number of spears, and in earliness were established between varieties and strains of asparagus. Mary Washington produced the highest yields and the largest spears of any variety under trial. Within a single variety strains differed significantly, for example one Martha Washington strain outyielded the other by an average of 657 lb. per acre per year.

Placement of fertilizer for Henderson bush lima beans in Virginia, M. M. PARKER and G. A. CUMINGS (Coop. U. S. D. A.). (*Virginia Truck Sta. Bul. 99 (1938), pp. 1557-1578, figs. 5*).—Applications by different methods of 500 and 1,000 lb. per acre of a 4-10-8 NPK mixture to Henderson bush lima beans growing on Sassafras sandy loam showed the desirability of placing the fertilizer in narrow bands from 2 to 3 in. at each side of the seed row and from 1 to 2 in. below the seed level. The greatest profusion of blooms and rapidity and uniformity of plant growth resulted from placement 2 in. to each side of the row and 1 in. below the seed level. This method also produced the earliest yield and the largest total yield. The use of 1,000 lb. of fertilizer per acre gave larger yields than 500 lb., but the increments were not sufficient to offset the cost of the additional fertilizer. Fertilizers mixed with the soil or broadcast immediately before planting were more or less injurious, depending upon the thoroughness of incorporation and the amount of soil moisture present during germination. Fertilizers placed on the top of the row became

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harmful under certain conditions of precipitation occurring during the germination period. The machine used in sowing the seed and distributing the fertilizer is described.

Influence of various factors on the shape of beet roots, R. C. Thompson. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 10, pp. 733–745, figs. 2*).—Variations in shape of beet roots due to various factors were studied by means of three numerical indexes. The shape indexes were found to vary with size of roots, soil texture, and seasonal conditions as determined by dates of planting and harvesting. Variation in fertility level failed to give significant changes in shape. In genetically pure strains of beets, variation in shape due to environment is not great except under wide extremes of soil texture and seasonal conditions.

The relation of cabbage hardiness to bound water, unfrozen water, and cell contraction when frozen, J. Levitt. (Univ. Minn.). (*Plant Physiol.*, *14* (*1939*), *No. 1, pp. 93–112, fig. 1*).—At any given temperature, hardened cabbage plants had less water withdrawn in the form of ice than did the unhardened. At a temperature which caused practically complete killing of unhardened plants, they retained 3.5 times as much water in the unfrozen state as did the hardened plants frozen to produce the same amount of injury. The amount of nonosmotically bound water in hardened plants was very small, and, although larger than that of unhardened plants at the same temperature (−5.6° C.), was nevertheless smaller when the two groups were compared at their respective critical freezing temperatures. In this case, more ice was formed per gram fresh weight in the hardened than in the unhardened plants. Cabbage hardiness, therefore, is not simply a matter of resistance to dehydration, nor directly related to the amount of ice that forms, but rather is due to some increased ability to resist the effects of freezing.

A fertility program for celery production on Everglades organic soils, J. R. Beckenbach (*Florida Sta. Bul. 333* (*1939*), *pp. 39, figs. 9*).—Of various trace elements required for celery growing on Everglades organic soils, Mn is said to be most commonly deficient. Zn, Cu, and B are also often present in inadequate amounts, and recommendations for supplying these four elements are given. Depth of the water table was found highly important, with the suggestion that except at the time of sowing the seed and setting the plants the table should be kept at a depth of from 16 to 24 in. throughout the growing period. Despite the fact that available N is being released in peat soils at all times, it was found, on the basis of eight successive yearly tests, that mixtures containing P and K plus 3 percent N gave higher yields than when the N was omitted. In 7 of the 8 yr. the increased yields were sufficient to more than pay for the N. The importance of K was shown in the fact that crops grown without this element were practically failures. On a 5-yr. average, 51 more crates per acre per year were produced with muriate of potash than with sulfate of potash. In comparing 6, 12, and 18 percent of K used with other materials, it was found that from the standpoint of both yield and net profit per acre 12 percent was most desirable. A 6 percent phosphate fertilizer properly balanced with N and K and applied at the rate of 1 ton per acre before setting the plants was considered nearly optimum where celery is grown annually and the plant trimmings returned to the soil. The ratio of the three elements N, P, and K should be in the order of 1:2:4. The author advises that celery should not be planted on freshly broken virgin soils, but rather should follow some crop of lower fertilizer requirements. Suggestions for fertilizer treatment of mucks in various stages of development are given.

Mushroom casing soil in relation to yield, E. B. Lambert and H. Humfeld (*U. S. Dept. Agr. Cir. 509* (*1939*), *pp. 12, figs. 2*).—With plats replicated in most

cases five times it was found that, in general, heavy soils gave larger yields than did those of sandy types. Clay loams appeared preferable wherever their physical condition was such that they did not puddle or cake. For applications of the casing layer, 2 or 3 weeks after spawning was apparently the best time. Soil approximately neutral in reaction gave better results than very acid or very alkaline material. The thickness of the casing was not important within reasonable limits, but a 1-in. layer appeared desirable. Heat sterilization of the soil caused marked reductions in yield in certain instances.

Use of the tenderometer in forecasting grades of Alaska peas for canning, E. P. Walls and W. B. Kemp. (Md. Expt. Sta.). (*Canner, 88 (1939), No. 11, pp. 20, 22*).—Based on 1938 studies of approximately 1,200 samples of either run-of-pod peas or of various sieve sizes, two sets of tables and formulas are presented for forecasting maturity grades by the use of the tenderometer.

Vegetative reproduction of squash types, W. K. Bailey. (P. R. Expt. Sta.). (*Science, 89 (1939), No. 2302, pp. 128, 129*).—Vigorous five- to seven-node cuttings with swollen root buds at several nodes were rooted successfully and fruited earlier than plants grown from seed.

Suggestions to tomato growers, J. S. Joffe and V. A. Tiedjens (*New Jersey Stas. Cir. 391 (1939), pp. 4*).—This includes brief practical suggestions as to soils, fertilizers, cover crops, growing of plants, control of pests, etc.

Experiments with growth controlling substances.—II, Response of fruit tree cuttings to treatment with synthetic root-forming substances, H. L. Pearse (*East Malling [Kent] Res. Sta. Ann. Rpt., 26 (1938), pp. 157–166, pls. 2*).—In continuation of this series (E. S. R., 78, p. 484), numerous trials with softwood cuttings of several varieties of pear, quince, apple, plum, and cherry showed that with suitable material root formation was accelerated and increased following treatment with indolebutyric and α-naphthalene acetic acid. The status of the mother plants at the time the cuttings were taken was important. In general, indolebutyric acid promoted the more fibrous root system. Subsequent treatment with vitamin B_1 did not increase successful rooting but did promote more vigorous subsequent growth in the rooted plants. No well-defined stimulation was secured from treating hardwood cuttings taken in autumn.

Establishing the orchard, T. J. Talbert (*Missouri Sta. Cir. 202 (1939), pp. 23, figs. 9*).—Included is general information on the selection and handling of nursery stock, selection of sites, preparation of soil, planning and planting the orchard, pruning, cultural practices, protection from pests, etc.

Pruning fruit plants, R. J. Barnett and G. A. Filinger (*Kans Sta. Cir. 197 (1939), pp. 26, figs. 14*).—This revision of the earlier noted pamphlet (E. S. R., 63, p. 446) presents in a like manner general information on the principles and practices of pruning fruit trees, with specific information on the various individual fruits.

Spraying program and pest control for fruit crops (*Ohio Sta. Bul. 599 (1939), pp. 52, figs. 19*).—With spray calendars for specific fruits, general information is supplied on spray materials, spraying equipment, and practices; on dusting; and on the treatment of various troubles (such as fire blight, cedar rust, peach borers, and rodents) not handled by spraying procedures.

Note on the effect of the variety of stock used to provide the intermediate stem-piece in some double-worked apple trees, M. C. Vyvyan (*East Malling [Kent] Res. Sta. Ann. Rpt., 26 (1938), pp. 148–156, figs. 3*).—At the end of 10 yr., Stirling Castle trees worked on Malling XII with intermediate pieces of Malling II in one case and of Malling XII in the other showed no obvious differences in average tree size. Measurements failed to show any significant effect of the intermediate piece on the vigor of the tree, whether expressed as wood growth, final weight, or rate of growth. However, by the

ninth year there were significantly more fruit buds per tree and per meter of wood on the Malling II/XII than on the Malling XII/XII trees. The two types of tree could readily be distinguished by the differential taper of the upper part of the trunk and by the swelling above the upper union in the II/XII group.

Studies in nursery technique: Shield budding—treatment of inserted buds with petroleum jelly, R. J. GARNER and D. H. HAMMOND (*East Malling [Kent] Res. Sta. Ann. Rpt., 26 (1938), pp. 115–117*).—Malling IX clonal stocks shield-budded with Cox Orange and tied with rubber strips or with raffia were, in part, smeared with petroleum jelly. The jelly treatment materially increased the bud "take," particularly in the raffia-bound lot. The use of petroleum jelly is inexpensive and is recommended for trial wherever unsatisfactory takes occur.

Are there different critical oxygen concentrations for the different phases of root activity? D. BOYNTON, J. DE VILLIERS, and W. REUTHER. (Cornell Univ.). (*Science, 88 (1938), No. 2294, pp. 569, 570*).—Controlled greenhouse studies with apple seedlings suggested that with O_2 in the soil atmosphere at 3 percent, roots subsist but grow slowly if at all. At 1 percent O_2, roots apparently lost weight. There was some indication that a high O_2 level may be necessary for the initiation of new roots from the existing root system. Roots of the apple seedlings did not grow normally at concentrations of O_2 below 10 percent, even though there was considerable growth between 5 and 10 percent. It was observed that the ash content in percentage of dry weight of apple seedlings decreased uniformly as the O_2 percentage decreased from 15 percent.

Causes and effects of size differences in apple trees in the nursery, F. C. BRADFORD and L. JOLEY (*Michigan Sta. Tech. Bul. 163 (1939), pp. 54, figs. 8*).—Of several factors concerned in size differences in nursery apple trees, the size of the apple from which the seeds were collected was not related per se to seedling size. Seed from small apples produced seedlings as vigorous as those grown from seed from large apples of the same variety. In a few instances, vigor of seedlings of the same variety varied with the pollen parent utilized, but in no case was the difference sufficient to affect performance in the nursery. Seedlings of diploid varieties, such as Jonathan, McIntosh, Yellow Bellflower, Northern Spy, and Wealthy, were as vigorous as those from the usual commercial sources.

Individual differences observed in the seedling year were maintained through the second year, also in the budded whip, and for the first 2 yr. in the orchard. The period of maximum growth and the time of cessation of growth were not affected by the size of the seedling on which the whip was budded, but the amount of growth was closely related to the size of the seedling. Trees budded on the smaller seedlings of diploids grew somewhat better than those budded on seedlings of triploids, but it was noted that their growth resembled that of trees on seedlings of triploids more closely than it did that of the trees on larger seedlings of diploids.

The authors conclude that the evidence at hand does not warrant any present affirmation or negation of genetic influences as the principal cause of enduring differences found among nursery trees.

Permanence of size differences in orchard trees, R. E. MARSHALL (*Michigan Sta. Quart. Bul., 21 (1939), No. 4, pp. 265–277, figs. 2*).—Data secured incidental to a long-time pruning study in an apple orchard including Oldenburg, Grimes Golden, Stayman Winesap, Baldwin, and Northern Spy varieties indicated that on the average the small trees at the time of planting remained smaller in size as measured by rate of trunk growth and top volume increment. Observations on the annual rings of filler trees removed at the end of 15 yr.

gave similar evidence, namely that the smallest and largest trees at the time of planting retained their relative positions at the end of the period.

Low temperature injury to fruit blossom.—I, On the damage caused to fruit blossom by varying degrees of cold, C. P. FIELD (*East Malling [Kent] Res. Sta. Ann. Rpt., 26 (1938), pp. 127–138, figs. 5*).—Observations on flowers of two apple varieties, crab "A" and Court Pendu Plat, following exposure to low temperatures in constant temperature chambers showed injury comparable to that occurring in the orchard under natural conditions. Temperatures at or below 29° F. caused damage proportional to the duration of the exposure. Slow cooling retarded the appearance of injury, but in general the time taken in thawing was not a factor. Wetting the blooms hastened injury. Attempts to harden blooms by holding them at 38° and 34° had little effect. Of materials injected into the shoots and flowers of the blackberry, only glycerin reduced susceptibility.

An apple irrigation trial, using soil moisture meters, W. S. ROGERS (*East Malling [Kent] Res. Sta. Ann. Rpt., 26 (1938), pp. 118–126, figs. 2*).—In the case of 20-year-old Early Victoria apples on seedling crab roots planted alternately at 14 ft. with James Grieve on Malling V, water equivalent to 8.9 in. of rain applied in two treatments in June and July increased the size of fruits about 11 percent. Because of the nature of the soil, much of the water was lost in the underlying porous rock. Observations on James Grieve apples stored following irrigation showed no appreciable increase in bitter pit. There was, however, sufficient natural rainfall to prevent any of the control trees from reaching the wilting point.

Why some growers fail and others succeed with the same apple spray program, C. L. BURKHOLDER and G. E. LEHKER (*Indiana Sta. Cir. 241 (1939), pp. 16, figs. 5*).—Information is given on the control of various important orchard pests including scale insects, aphids, apple scab, and codling moth. Failure to control pests is believed to be more often due to improper methods than to variation in spray materials. In the case of codling moth, effective control of the first brood prevents the building up of large succeeding generations. Among recommendations for codling moth control are the screening of packing sheds, the concentration of sprays during the hatching period and when fruits are small, the timing of sprays by the use of moth traps, and pruning to open up the tree and careful spraying of the tops of the trees as well as the lower portions.

Sun-coloring apples, C. W. ELLENWOOD and T. E. FOWLER (*Ohio Sta. Bimo. Bul. 198 (1939), pp. 39–46, figs. 2*).—Stating that sun coloring is not a new proposition, despite renewed interest, the authors discuss the results secured with apples placed on straw mulch, on wire racks, and directly in cold storage. The most striking color change secured from sun exposure was in the case of McIntosh, with good results in the case of Northern Spy and others. Although there was some softening of apples in the open, there was no significant loss in keeping quality provided the fruit was stored immediately following sun coloring. The use of mulch rather than racks appeared more practical. Sun coloring permitted the entire harvesting of one tree crop at one time.

Pear rootstocks from seed.—I, Experiments on methods of germinating pear seeds; II, Studies on the variation in seedling pear trees, H. M. TYDEMAN (*East Malling [Kent] Res. Sta. Ann. Rpt., 26 (1938), pp. 103–114, pl. 1*).—Trials with various rootstock varieties indicated that pear seeds require a short rest period under cold conditions to insure satisfactory germination. Placement of seed in an outdoor pit from early November to February gave good results. There were no consistent differences between the several clons with respect to germination. There was some indication that the removal of the mucilaginous film from the seeds by washing in water facilitated their germination when sown immediately after separation from the fruits.

Botanical studies in part 2 on the seedlings grown from open-pollinated seed from East Malling selected Free Pear AI stock and from seed collected in North Caucasus showed the East Malling group to be more variable than the North Caucasus, due, apparently, to the greater opportunities at East Malling for cross-fertilization.

Effect of ethylene on certain chemical changes associated with the ripening of pears, E. Hansen. (Oreg. Expt. Sta.). (*Plant Physiol.*, *14* (*1939*), *No. 1*, *pp. 145–161*, *figs. 2*).—Bartlett and Anjou pears gathered at approximately 2-week intervals beginning 5 weeks after blooming and extending beyond the usual commercial harvest season were placed in jars in which was maintained a concentration of 1 part in 1,000 by volume of ethylene. As a control, other fruits were kept in ventilated jars to prevent gas accumulation. Fruit of the first picking produced barely enough ethylene to induce detectable epinasty of potato leaves. Untreated fruits of the first picking gained no soluble pectin in 12 days, whereas ethylene-treated fruits showed a marked increase at the end of 8 days. The changes brought about by ethylene were identical to those taking place during the normal ripening. Later harvests showed increasing ethylene output. There was an increased rate of starch hydrolysis, higher sugar content, more rapid change of protopectin to pectin, and increased respiratory activity in ethylene-treated fruits. The increase in the rate of softening in ethylene-treated fruits was correlated definitely with increase in rate of pectin changes. Ethylene effects were shortest in duration with sugar and starch changes and longest with pectin reactions and respiration.

A further experiment in thinning the fruit of Victoria plums, A. C. Painter and B. L. Wates (*East Malling* [*Kent*] *Res. Sta. Ann. Rpt.*, *26* (*1938*), *pp. 139–144*).—Comparing the effects of removal of fruits so that those remaining were approximately 1 in. apart in one case and 2 in. in another, the authors found that the more heavily thinned trees produced considerably more large-sized fruits and far less small fruits. Total yields were decreased by the heavy thinning, which also tended to hasten maturity. The market quality of the fruits of any given size was much the same from both treatments.

The influence of certain hormone-like substances on the rooting of hardwood blueberry cuttings, S. Johnston (*Michigan Sta. Quart. Bul.*, *21* (*1939*), *No. 4*, *pp. 255–258*).—In the hope of reducing the time required to secure good root development in hardwood blueberry cuttings, cuttings of Rubel, Adams, Cabot, and Pioneer were treated with various concentrations of Hormodin A and Auxilin. The results were such as to lead to the conclusion that the materials under trial were of little value in hastening root formation in the blueberry.

Grapes in Arizona, A. H. Finch, R. H. Hilgeman, H. F. Tate, R. B. Streets, and L. P. Wehrle (*Arizona Sta. Bul. 162* (*1939*), *pp. 245–292*, *figs. 19*).—This paper, presented in five parts which deal, respectively, with some general aspects, grape varieties for Arizona, grape pruning, grape diseases, and grape insects in Arizona, consists for the most part of information of a general nature, but data on varieties are based on extensive trials.

Boron in citrus nutrition in Florida, A. F. Camp. (Fla. Expt. Sta.). (*Citrus Indus.*, *20* (*1939*), *No. 2*, *pp. 6, 7, 18*).—Following a review of the literature, the author points out the fact that boron, although an essential nutrient, may easily become a toxic factor. An instance of possible deficiency in a Florida citrus grove is discussed advisedly pending the results of experimental studies undey way.

Rootstock influence on the composition of citrus fruits, R. W. Hodgson and E. R. Eggers. (Univ. Calif.). (*Calif. Citrog.*, *23* (*1938*), *No. 12*, *pp. 499, 531*).—Fruits taken from young bearing trees of Valencia and Washington Navel oranges, Marsh grapefruit, Lisbon and Eureka lemons, and Bearss lime, all

budded on sour orange, sweet orange, rough lemon, grapefruit, and trifoliate orange roots, were studied as to composition. Trifoliate orange, the most dwarfing of the several stocks, produced the highest percentage of soluble solids in the juice in all cases. Rough lemon, the most vigorous stock, produced the lowest soluble-solids content. Both species influenced acid content of the fruits in the same manner as soluble solids. Paradoxically both stocks had an approximately equal effect in producing a high soluble solids: acid ratio in the juice.

Progress report of lemon rootstock experiments, L. D. BATCHELOR and H. J. WEBBER. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 24 (1939), No. 5, pp. 160, 161, 190, 191*).—In 1927 two experimental rootstock orchards were established, one at Riverside and one at Fillmore, Calif. All the trees of each stock were propagated from a single parent tree, and all the buds of the two varieties used, Eureka and Lisbon, were taken from individual trees. Among observations at the end of 12 yr. of work was one that the sweet orange has proved superior to all other rootstocks tested. The sour orange and the rough lemon stocks were apparently much better adapted to light than to heavy soils. On sour orange roots in heavy soil, both Eureka and Lisbon showed a large percentage of trees affected with lemon decline. On light sandy soils, both varieties on sour orange showed very little evidence of this defect. The results showed that lemon decline is apparently a rootstock and soil-adaptation problem in its broadest sense.

A method for the treatment of cuttings and roots of the pecan with root-inducing chemicals, C. L. SMITH and L. D. ROMBERG. (U. S. D. A.). (*Plant Physiol., 14 (1939), No. 1, pp. 177, 178*).—The insertion in holes bored in the cutting or root of wood toothpicks which had been immersed in an alcohol solution of indolebutyric acid for 24 hr. was successful in inducing root formation. The amount of chemical per toothpick was readily adjusted by changing the concentration.

Composition and rooting of American holly cuttings as affected by treatment with indolebutyric acid, N. W. STUART and P. C. MARTH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 839–844, fig. 1*).—In proper concentrations and durations of treatment, indolebutyric acid was found effective in hastening the rooting of holly cuttings. The stems of cuttings that had been treated maintained a higher percentage of sugar than the untreated until extensive root growth occurred. The gradual decrease in starch content of the leaves was similar in both treated and untreated cuttings. The results with wounded holly cuttings indicated that slicing of the bark or slitting of the stems, as a supplementary treatment, may be an important practical aid in increasing the effectiveness of the application of growth substances. Indolebutyric acid treatment of cuttings that had been held untreated in the propagating bed for 76 days without rooting induced a vigorous rooting response within 21 days, with the wounded cuttings again giving much the better response.

Gravel culture of flowering plants in the greenhouse, A. WAGNER and A. LAURIE (*Ohio Sta. Bimo. Bul. 198 (1939), pp. 47–52, figs. 3*).—Gravel culture with nutrient solutions is said to have numerous advantages, including the absence of watering, weeding, cultivation, fertilization, and changing of the soil. In addition, the type of growth can be more or less controlled by changing the concentrations of nutrients. Soil-borne pests and diseases are absent, and in some cases better-quality blooms are produced. The authors discuss nutrient solutions, methods of application, and some of the results secured with roses and chrysanthemums. Among crops grown successfully were roses, carnations, chrysanthemums, sweet peas, snapdragons, begonias, and marigolds.

New chrysanthemums, F. L. MULFORD (*U. S. Dept. Agr. Cir. 528 (1939), pp. 8, figs. 4*).—Descriptive notes are presented on 12 newly named hardy

chrysanthemums resulting from rigorous selection from among thousands of open-pollinated seedlings.

Growth and flowering of the gladiolus: Influence of certain morphological and physiological characteristics of the corms, L. C. GROVE (*Iowa Sta. Res. Bul. 253 (1939), pp. 81–112, figs. 7*).—Over a 2-yr. period comparisons were made of the growth and flowering of high- and low-crowned gladiolus corms of nine varieties, including primulinus, grandiflorus, and hybrid types. In addition, chemical studies were made of the corms of the Excellence variety grown in the field and in darkness. The results of the morphological studies indicated that no one shape or size of corm can be associated with any definite qualitative flowering capacity. In most varieties, low-crowned corms completed their emergence from the soil in less time and produced taller spikes than did the high-crowned. Low-crowned corms always produced greater total leaf area, more spikes, and a greater number of florets per corm than did the high-crowned.

As to chemical composition, the size and shape of the corm did not appear to be associated with significant differences in the percentages of reserve materials. High-crowned corms contained a higher percentage of starch and sugars at the time of planting and for 4 weeks thereafter. However, because of their larger size, the low-crowned corms contained greater total reserves and are believed preferable for forcing where light conditions are not of the best. The author suggests that the lower percentages of reserves in the low-crowned corms in the early growth stage is due to the greater number of shoots. This assumption was confirmed by the fact that analyses prior to sprouting showed no significant difference in percentage of sugars in the two corm types. Nearly one-half of the total N reserves in the corms was exhausted within 2 weeks after planting, suggesting the need of supplying N at an early stage on soils low in this element. The seasonal trend in the disappearance of food reserves from mother corms showed a rapid decrease during the first 6 weeks.

Development and care of lawns, H. F. MAJOR (*Missouri Sta. Cir. 204 (1939), pp. 12, figs. 4*).—General information is offered on the construction of new lawns and maintenance of old lawns, with suggestions as to fertilization, seeding, and general management.

FORESTRY

A modified tree classification for use in growth studies and timber marking in Black Hills ponderosa pine, E. M. HORNIBROOK. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 6, pp. 483–488, figs. 3*).—Keen's tree classification, with certain modifications, was found a satisfactory criterion of the relative growth capacities of Black Hills ponderosa pine, both in uncut and selectively cut stands. The mean difference in diameter growth between age classes and between vigor classes was found highly significant. In general, the effect of average release by selection cutting on diameter growth was to accelerate the growth rate equivalent to that of trees in uncut stands having the same vigor class but one age class younger.

The decagon for vegetation studies, M. CULLEY. (U. S. D. A. and Univ. Ariz.). (*Jour. Forestry, 37 (1939), No. 6, pp. 492, 493, figs. 2*).—Herein is offered a description of a method found useful in estimating the density of ground covers, particularly grasses and low-growing shrubs. The method was found particularly promising in making pasture surveys where a considerable number of temporary plats are located at random over the range.

An extension rod for measuring tree heights, J. E. HETZEL. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 6, pp. 494, 495, fig. 1*).—A description is given of an extension rod consisting of four 8-ft. sliding sections which was found useful under widely varying conditions for measuring the height of forest trees.

Increment core handling, E. Fritz. (Univ. Calif.). (*Jour. Forestry, 37* (*1939*), *No. 6, pp. 491, 492, fig. 1*).—A description is offered of a field book designed for handling increment cores in the field and transporting them safely to the laboratory.

A soil boring tool for frost depth determination, B. C. Goodell. (U. S. D. A.). (*Jour. Forestry, 37* (*1939*), *No. 6, pp. 457–459, figs. 2*).—A descriptive account is presented of a tool and method found useful in measuring the depth of frozen soil.

[Studies in forest nurseries], S. A. Wilde, J. C. Kopitke, J. G. Cady, R. Wittenkamp, H. M. Galloway, E. L. Stone, and D. P. White. (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 443* (*1939*), *pp. 56–58, fig. 1*).—Herein is discussed the progress of investigations relating to fertilizer and soil reaction needs of forest seedlings, use of liquid fertilizers, N starvation, methods of applying organic matter, use of alkaline raw humus, and factors such as damping-off disease in limiting the growth of pines in southern Wisconsin.

Root response to slash pine seedlings to indolebutyric acid, D. K. Plank. (Univ. Fla.). (*Jour. Forestry, 37* (*1939*), *No. 6, pp. 497, 498, fig. 1*).—In a limited trial there was observed, in the case of nursery-grown seedlings planted following treatment in a deep, moderately dry Norfolk sand, greater survival, much longer taproots, and better lateral root development in the treated trees than in the controls.

Why forest plantations fail, P. O. Rudolf. (U. S. D. A. and Univ. Minn.). (*Jour. Forestry, 37* (*1939*), *No. 5, pp. 377–383*).—In a study conducted by the Lake States Forest Experiment Station on the Huron National Forest, Mich., following the severe drought of 1936, it was observed that tree seedlings planted with roots predominantly in a single plane had a significantly greater mortality and made less height growth than did those with better root distribution. Heat and drought, particularly heat, accounted for most of the mortality. Neither soil acidity nor percentage of fine material in the soil showed any well-defined relationship to survival. It is suggested that, if planting is done in the open, some type of artificial shade should be provided, possibly by preliminary plantings of hardy shrubs or trees.

Which species shall we plant? E. Secrest (*Cent. States Forestry Cong. Proc., 1* (*1930*), *pp. 203–213, fig. 1*).—In this summary of Ohio experiences, the author discusses various species of forest trees with respect to their behavior, adaptability, seedling requirements, etc. Among conclusions reached are that mixtures of pine are more desirable than pure stands, that better survival follows the use of 4-year-old transplants than younger seedlings, that spacings closer than 6 by 6 ft. are not advisable, and that further research is needed to establish what species should be planted under various conditions.

[Testing of forest tree species] (*Wyoming Sta. Rpt. 1938, pp. 31, 33*).—The results of trials of numerous species are discussed.

A hardwood record, J. A. Cope. (Cornell Univ.). (*Jour. Forestry, 37* (*1939*), *No. 6, pp. 495–497*).—Data are presented on the unusual growth and on thinning operations in an area in Monroe County, N. Y., clear cut in the winter of 1917-18.

A new alder, Alnus rubra Bong. pinnatisecta var. nov., T. J. Starker. (Oreg. State Col.). (*Jour. Forestry, 37* (*1939*), *No. 5, pp. 415–417, fig. 1*).—A brief technical description is given of a new variety of alder discovered a few miles northwest of Portland, Oreg.

Some physiological responses to close pruning of northern white pine, W. R. Adams and M. R. Schneller (*Vermont Sta. Bul. 444* (*1939*), *pp. 26, pls. 8*).—In the case of dominant and codominant trees in a 25-year-old white pine plantation spaced 6 by 6 ft. and pruned at various times throughout the

year, there were noted certain well-marked responses to the type and season of pruning as manifested in the character of the wound healing tissues. Deliberate cutting of the branch base of live branches resulted in callus formation in 98 percent of the cases; but where the branch base was not cut, less than 25 percent of the live branches, saw pruned without injury to the branch base or removed with point-cut pruners, showed callus at the end of the first growing season. Some advantage was gained, also, in injuring the branch base of excised limbs which had been dead for 3 or 4 yr. or less. There was little advantage in the case of older dead branches, because the living branch base was no longer present. Study of the callus arch formed showed it to consist initially of parenchyma cells produced rapidly to protect the phellogen and vascular cambium, which is later pushed aside by the formation of true corky cells by the phellogen and of xylem and phloem by the vascular cambium. The original parenchyma remains in contact with the resinous coating on the branch stub. At the end of the growing season the callus consisted mainly of regular phloem and xylem cells. Abnormal quantities of resin ducts were found in the xylem tissue in and directly adjacent to the callus. When pruning was delayed until June, 55 percent of the ring width consisted of thicker- and darker-walled late wood cells. A narrow band of heartwood spreading from the branch heartwood to the outer margin of the branch stub occurred in all winter-pruned live branches.

Variation in the specific gravity of the springwood and summerwood of four species of southern pines, B. H. Paul. (U. S. D. A. and Univ. Wis.). (*Jour. Forestry, 37 (1939), No. 6, pp. 478–482, figs. 5*).—The weight or density of the wood of any of the four southern pines (slash, longleaf, loblolly, and shortleaf) was found to vary over an exceedingly wide range. Within a single species, blocks of wood were found with double the density of others. Obviously, such variations exert a profound influence on strength, workability, shrinkage, and capacity to hold paint.

Mortality in cutover stands of ponderosa pine, G. A. Pearson. (U. S. D. A. and Univ. Ariz.). (*Jour. Forestry, 37 (1939), No. 5, pp. 383–387, fig. 1*).—Of various agencies responsible for the death of ponderosa pines in the Southwest, wind and lightning were about equal and of primary importance, followed in descending order by mistletoe and insects, chiefly bark beetles. Data on several plats pointed consistently to the fact that the largest losses occur among the larger trees. Above a diameter of 23 in., there was a comparatively rapid increase in mortality rate.

Farm windbreak-handling trees to withstand drought conditions, E. J. George. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 5, pp. 11–14, figs. 2*).—As a result of experiences at the Northern Great Plains Field Station, information is offered on the establishment, maintenance, and function of windbreaks. Lack of moisture, said to be the major limiting factor, may be offset in part by so planting the trees as to retain the drifting snow.

Fire in land use and management, H. C. Hanson. (N. Dak. Expt. Sta.). (*Amer. Midland Nat., 21 (1939), No. 2, pp. 415–434*).—Based on an exhaustive study of the literature, the conclusion is reached that fire has certain values, namely, in destroying debris and pests, clearing of land, and improvement of grazing conditions. However, in some cases fire causes irreparable damage, and research is needed to determine fully and accurately the values and losses.

Controlled burning in the western white pine type, K. P. Davis and K. A. Klehm. (U. S. D. A.). (*Jour. Forestry, 37 (1939), No. 5, pp. 399–407, figs. 3*).—Admitting that controlled burning of slash and debris is a matter of question, the authors suggest that under certain conditions where adequate precautions are taken burning has a definite place in western white pine man-

agement. The details of burning technic are discussed, with observations on costs, subsequent treatments, etc.

Fire Control Notes, [April 1939] (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, 3 (1939), No. 2, pp. II+36, figs. 20*).—This quarterly periodical contains brief articles relating to equipment used in locating and controlling forest fires, organization of fire-fighting units, training of personnel, etc.

DISEASES OF PLANTS

Elements of plant pathology, I. E. MELHUS and G. C. KENT (*New York: Macmillan Co., 1939, pp. X+493, figs. 259*).—In this textbook the emphasis is placed on parasitism in disease processes and the principles relating to control measures, coupled with the condensation and omission of unnecessary morphological and mycological data. The objectives in choosing material were to meet the minimum needs in leading the student to appreciate the influence of plant pathology on human affairs, to acquire an understanding of health and disease in plants, to understand the phenomena of parasitism, and to acquire as much information as possible about the characteristics of diseases, their symptoms, causes, and control. Following the introduction, there are chapters on plant pathology and human affairs, the development of plant pathology, disease in plants, parasitism, the influence of environment on plant diseases, and the principles of control measures. With respect to specific diseases, nine chapters deal, respectively, with diseases caused by Phycomycetes, bacteria, viruses, Ascomycetes, Fungi Imperfecti, Basidiomycetes, seed plants, nematodes, and nonparasitic agents. A glossary, a bibliography, and an index are provided.

***Studies on the nutrition of fungi.*—*II, Effect of inoculum on the growth* of the colony,** L. H. LEONIAN and V. G. LILLY. (W. Va. Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 592–596, figs. 2*).—Continuing this study (E. S. R., 80, p. 21), by use of thiamin and dextrose as test substances and *Phycomyces blakesleeanus* as test organism it was found that for all practical purposes the amount of these substances in the average size inoculum (3 by 2 mm.) is not significant for the initiation and growth of the new colony. At least 100 times the optimum amount of thiamin must be used before an inoculum piece of such size can show even a slight effect, and 1,000–10,000 times the optimum before a significant growth results. An agar disk 5 mm. in diameter and containing 20 percent dextrose failed to influence growth, but when the diameter was increased to 10 mm. a significant growth followed.

Handbook of virus investigation.—I. The development of virus investigation and its problems, the morphology of different viruses, the culture of different viruses outside their hosts, the biochemistry and biophysics of viruses, edited by F. M. BURNET, R. DOERR, W. J. ELFORD, G. M. FINDLAY, M. HAITINGER, C. HALLAUER, M. KAISER, and W. M. STANLEY (*Handbuch der Virusforschung*, edited by R. DOERR and C. HALLAUER. *1. Hälfte, Die Entwicklung der Virusforschung und ihre Problematik, Morphologie der Virusarten, die Züchtung der Virusarten ausserhalb ihrer Wirte. Biochemistry and Biophysics of Viruses. Wien (Vienna): Julius Springer, 1938, pt. 1, pp. XII+546, figs. 71*).—This is a monographic compendium containing sections in German or English by various contributors and with copious bibliographies.

Methods for virus studies, H. DA ROCHA-LIMA, J. REIS, and K. SILBERSCHMIDT (*Methoden der Virusforschung. Handbuch der biologischen Arbeitsmethoden, Abt. XII, Teil 2, Heft 8. Berlin and Wien (Vienna): Urban & Schwarzenberg, 1939, XII, pt. 2, No. 8, pp. 1135–1489, figs.* [54]).—This is a monographic handbook of methods for use in the investigation of virus diseases of both plants and animals, with literature references at the end of the individual sections.

The nomenclature of plant viruses, G. C. Ainsworth (*Chron. Bot., 5 (1939), No. 2–3, pp. 193, 194*).—A discussion with proposal of a system of designating virus types and strains.

The ultracentrifugal analysis of the latent mosaic virus protein, R. W. G. Wyckoff (*Jour. Biol. Chem., 128 (1939), No. 3, pp. 729–733, figs. 6*).—In previously reported studies (e. g., E. S. R., 78, p. 803; 80, p. 358), sedimentation diagrams have been made of several virus protein solutions at a wide variety of pH values and it has been demonstrated that in each case the virus protein molecule and the infectivity of the virus have the same range of pH stability. The same type of study is here reported for the latent mosaic virus protein, including detailed descriptions of the methods and results.

Bacterium tumefaciens [trans. title], L. Montemartini (*Bol. Ist. Sieroterap. Milan., 18 (1938), No. 9, pp. 551–588*).—This comprehensive review (about 12 double-column pages of references) treats the subject matter mainly under identification and synonymy of the bacteria concerned, the question of a homogeneous species or of diverse races, the pathogenesis of the disease and its gross and microscopical pathology, the hosts (including a list), its geographical distribution, its control, and comparisons between the *B. tumefaciens* tumors of plants and animal tumors.

Bacterial leaf-spot diseases, J. J. Reid, M. A. Farrell, and D. E. Haley. (Pa. Expt. Sta.). (*Science, 89 (1939), No. 2320, pp. 566, 567*).—The authors claim on experimental evidence that the *Phytomonas tabaci* of tobacco wildfire is a transitory physiological adaptation of the saprophytic *Pseudomonas fluorescens*, and that field infection is due not to the mere presence of this ubiquitous organism but to its association with improper host nutrition. Grower practices thought largely responsible for the severity of tobacco leaf spot infections are, in decreasing importance, the incorporation of large amounts of organic nitrogen in the soil, use of too much nitrogen and too little potash fertilization, excessive lime applications, and in some cases poor tilth. The authors claim that practices tending to produce a normally resistant plant of high quality and good yield are rotations reducing the amount of organic nitrogen in the soil, preliminary rotting of all manure and use of liberal amounts to improve tilth and aid potash intake, suitable applications of fertilizer with inorganic in excess of organic nitrogen, and suitable cultivation to insure maximum uptake of potash and other essentials.

Subsidiary studies of several other *Phytomonas* leaf spot diseases gave comparable results, thus emphasizing the basic similarity of bacterial leaf spot diseases and the relation of the pathological condition to the improper nitrogen-mineral balance in the host.

Nutrition and bacterial virulence, G. Metcalfe (*Chron. Bot., 5 (1939), No. 2–3, pp. 189, 190*).—A review with citations, relating to phytopathogenic forms.

The development of Mycosphaerella berkeleyii, W. A. Jenkins. (Ga. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 8, pp. 617–620, pl. 1*).—Structural and developmental details of the spermogonia and perithecia of *M. berkeleyii* are said to differ from those of *M. arachidicola*, principally in the greater amount of stroma surrounding the fruit bodies, longer sterigmata on the spermatial mother cells, greater number of archicarps in the young perithecia, greater amount of fertile tissue in the base of the perithecium, in the origin of periphyses, and in the tardiness of ascospore discharge. In addition, as previously stated (E. S. R., 79, p. 350), the two fungi produce different symptoms on their mutual host (peanut) and differ in type of conidial fructifications, host relationships, culture characteristics, and size of ascospores.

Methods of determination of physiologic races of Rhizoctonia solani on the basis of parasitism on several crop plants, E. L. LeClerg. (U. S. D. A. and Minn. Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 609–616, fig. 1*).—The author compared damping-off tests and direct inoculation of underground stems of older plants as a basis for determining physiologic races of *R. solani*. "The results for individual isolates from the damping-off data in successive tests were more variable than were those from direct inoculations. The latter method appears most promising, if a large number of plants are inoculated with each isolate to be tested and if environmental conditions can be accurately controlled."

The Plant Disease Reporter, [June 1 and 15, 1939] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 23 (1939), Nos. 10, pp. 159–180; 11, pp. 181–202, figs. 3*).—The following are included:

No. 10.—Diseases of fruits and vegetables on the New York market during the months of January, February, and March, 1939, by C. O. Bratley and J. S. Wiant; the Utah tomato disease situation [curly top, *Verticillium* wilt, and bacterial canker] in 1938, by H. L. Blood and R. M. Christiansen; spindle sprout in potatoes on Long Island, by F. M. Blodgett; reports on vegetable diseases in New York, including onion smut and downy mildew in the muck crop areas, and truck crop diseases on Long Island; flax rust in Texas, by G. E. Altstatt; diseases of cereals in Georgia, by J. H. Miller; observations on small grain diseases in Virginia, May 9 to 15, 1939, by S. B. Fenne; other reports on diseases of cereals, including rusts in Texas, condition of winter wheat in Kansas, and the first report of the year of wheat leaf rust in Nebraska; tobacco downy mildew appears in Massachusetts, by O. C. Boyd; downy mildew and other tobacco diseases in Kentucky, by E. M. Johnson; downy mildew on tobacco in Ohio, by C. C. Allison; tobacco diseases in Georgia, by H. I. Borders; bacterial ring spot of potato in Wyoming, by G. Hartman; and plant diseases in southern California, by H. G. MacMillan and O. A. Plunkett.

No. 11.—A tabulation of elm specimens cultured and percentages yielding *Ceratostomella ulmi*, 1930 to 1938, by E. G. Kelsheimer, L. M. Fenner, C. E. Dike, and C. May; observations on the death of peach trees (probably due to a combination of summer drought followed by rain in the late fall and subsequent marked temperature fluctuations) in the Nashville, Ark., peach district in 1939, by J. C. Dunegan; reports on the development of apple scab in Rhode Island, New York, Delaware, Illinois, northwest Arkansas, and Wisconsin; reports on fire blight from New York, Ohio, Illinois, and Wisconsin; notes on the cedar rusts from Massachusetts, New York, Illinois, and Wisconsin; reports on peach diseases, including leaf curl and *Phoma* disease in Delaware, and leaf curl and bacterial spot in Illinois; reports on diseases of cherry, including bacterial gummosis on sweet cherry trees in New York, cherry leaf spot in New York, and leaf spot in Wisconsin; other reports on fruit diseases, including black rot leaf spot on apple in Delaware, red core disease of strawberry in Delaware, and orange rust on wild blackberries in Illinois; some reports on diseases of tobacco (in Kentucky blue mold in old plant beds, a destructive epidemic of bacterial leaf spots in Kentucky, and sun scald or sun burn on tobacco in North Carolina); cottonseed treatment effective in Arkansas this year, by V. H. Young; pasmo disease of flax in the Lower Rio Grande Valley of Texas, by G. H. Godfrey and H. Rich; observations on flax diseases in Texas, by A. C. Dillman; cereal diseases in New York, by K. D. Butler; brief notes on cereal diseases, including leaf rust on wheat in Kentucky, and wheat diseases in Oklahoma and Kansas; bacterial ring rot of potatoes in Kern County, Calif., by P. A. Ark and E. W. Bodine; plant diseases in southern California, by

H. G. MacMillan and O. A. Plunkett; and brief notes on potato blackleg in Kentucky.

Reports on research for 1938: Plant pathology, G. M. Reed (*Brooklyn Bot. Gard. Rec., 28 (1939), No. 2, pp. 47–51*).—Reports of progress are included on studies of the inheritance of resistance in oat hybrids to loose and covered smuts, physiologic races of oat smuts, experimentally produced physiologic races of oat smuts, and sorghum smut investigations.

[Abstracts of papers on plant diseases presented at University of Colorado, 1937] (*Jour. Colo.-Wyo. Acad. Sci., 2 (1938), No. 4, pp. 25, 26*).—Abstracts of the following are included: Invasion of Onion Roots by *Phoma terrestris* Hansen, and Vascular Rhizoctonosis of Sugar Beets, both by W. A. Kreutzer (Colo. State Col.).

[Abstracts of papers presented at Colorado State College of Education, 1938] (*Jour. Colo.-Wyo. Acad. Sci., 2 (1939), No. 5, pp. 32, 33, 34, 39*).—Abstracts of the following papers of interest to phytopathology are included: The Resistance of Potato Dry-Rot Fusaria to Cold Temperatures, and Treating Cottonwoods for Chlorosis, both by G. H. Starr (Wyo. Expt. Sta.); and Further Studies on the Pink-Root Disease of Onions, by W. A. Kreutzer, and The Effects of HCN Gas, Methyl Bromide, and Methyl Bromide and Carbon Dioxide on Tomato Fruits and Greenhouse Plants, by C. R. Jones (both Colo. State Col.).

Kansas mycological notes, 1937, C. O. Johnston and T. E. Brooks. (U. S. D. A. and Kans. State Col.). (*Kans. Acad. Sci. Trans., 41 (1938), pp. 121–123*).—Seasonal field notes, with particular reference to cereal rusts, tree diseases, and fungi new to Kansas, of which a list of 14 is given.

[Phytopathology at the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 421 (1939), pp. 20–23, 35–37, 45, 46*).—Brief reports are included on work with copper sprays on muskmelons, cucumbers, tomatoes, carrots, and beets; "X disease" of peach studies, including control by destroying neighboring chokecherries; apple sprays; chestnut blight; elm and maple diseases; nematode control of chrysanthemums; control of white pine blister rust and of Dutch elm disease; and tobacco diseases at the Tobacco Substation, including downy mildew.

[Plant disease studies by the Kentucky Station] (*Kentucky Sta. Rpt. 1938, pt. 1, pp. 18, 21, 21–25*).—Observations and progress of work on the following are included: Phony peach disease (coop. U. S. D. A.); the effect of boron on the growth of plants; mosaic-resistant tobacco; a new tobacco plant-bed disease (apparently due to high salt content of soil surface); bordeaux treatment of tobacco seedbeds; inoculation and longevity studies with *Bacterium tabacum* (=*Phytomonas tabaci*) and *B. angulatum* (=*P. angulata*); *Fusarium* yellows of tobacco; mosaic-free "barn-cured" chewing tobacco; and water-soaking injury to tobacco leaves, and the relation of stomata to water soaking.

[Plant disease work by the Massachusetts Station] (*Massachusetts Sta. Bul. 355 (1939), pp. 15–17, 20–22, 29–33, 35, 36, 42, 44, 45*).—Reports of progress are included on the following: Onion blast disease, by W. G. Colby; tobacco disease studies, including black root rot, and reductions in yield and quality due to mosaic, both by C. V. Kightlinger (both coop. U. S. D. A.); diseases of ornamental herbaceous plants due to soil-infesting organisms, with particular attention to control, and damping-off and growth of seedlings and cuttings of woody plants as affected by soil treatments and environal modifications, both by W. L. Doran; chemical soil surface treatments in hotbeds for controlling damping-off of early forcing vegetables, by Doran and E. F. Guba; apple scab control, and sprays for cucumber, muskmelon, and tomato, both by Guba and

C. J. Gilgut; control of greenhouse vegetable diseases, by Guba; diseases of trees in Massachusetts, by M. A. McKenzie and A. V. Osmun; studies of some physical and chemical properties of mosaic viruses, by M. E. Freeman; development of cranberry strains resistant to false blossom, spraying experiments for control of rosebloom, and spraying experiments for cranberry fruit rot control, all by H. F. Bergman and W. E. Truran; and blueberry disease studies, by Bergman.

[Plant pathology at the Puerto Rico College Station] (*Puerto Rico Col. Sta. Rpt. 1938, pp. 44–46, 48–54, 61, 62, 75, 76*).—Brief progress reports concern the following: The development of new eggplant varieties resistant to bacterial wilt, and new cucumber varieties resistant to downy mildew, both by A. Roque and J. Adsuar; diseases of bananas and plantains, particularly twisted top, bunchy top, black tip, and *Gloeosporium* fruit rot, by A. R. López; *Cercospora* leaf spot of bananas, by M. T. Cook; coffee root rots, particularly *Rosellinia bunodes* and Fusaria, by L. A. Alvarez and Cook; disease survey of coffee farms, *Colletotrichum* dieback of coffee, and "mal de guaba" disease of *Inga inga*, all by Alvarez; pineapple diseases (particularly wilt), sugarcane diseases, and diseases of yams (with special reference to fungus isolations), all by López; soil alkalinity as an indirect cause of a serious chlorosis in coffee trees, by J. Guiscafré Arrillaga and L. A. Gómez; and variety-resistance tests against mosaic of sugarcane, by P. Richardson Kuntz.

[Phytopathology at the Wisconsin Station]. (Partly coop. U. S. D. A.). (*Wisconsin Sta. Bul. 443 (1939), pp. 6, 7, 8, 14–33, figs. 9*).—Brief accounts are included of a new laboratory procedure for separating and identifying plant viruses by chemicals, by W. B. Allington and J. Johnson; the development of scab-resistant potato breeding stock, by G. H. Rieman, R. H. Larson, and J. C. Walker; the behavior of early blight (*Macrosporium solani*) on tomato, development of better disease-resistant tomato varieties for the State, and tomato spraying tests, all by O. C. Whipple and Walker; fertilizer in the control of root rot of canning peas, by Walker and F. L. Musbach; the practicability of seed treatment for canning peas in Wisconsin, by Walker and E. J. Delwiche; development of resistance to near-wilt in peas by breeding, and early mosaic-resistant canning beans producing best yields, both by Walker; borax in the prevention of diseases of garden beets, sugar beets, and cabbage, by Walker, J. P. Jolivette, and J. G. McLean; some commercial cabbage seed susceptible to yellows, by Walker; factors affecting yellow dwarf of potatoes, by R. H. Larson and Walker; spread of potato virus diseases by various insects, by Walker and Larson; variations in the degree of scab resistance in potatoes with conditions, by Walker, Larson, and A. R. Albert; straw as an aid in preventing "sprain" in potatoes, by Larson, Walker, and Albert; spraying of potatoes proved advantageous in both wet and dry years, by Whipple and T. C. Allen; modified bordeaux spray promising for cherry leaf spot control, by G. W. Keitt and C. N. Clayton; and studies of forest tree diseases, including dying of oak trees, by A. J. Riker and C. A. Richards, white pine blister rust, by Riker and T. F. Kouba, and damping-off in forest nurseries, by Riker and L. F. Roth.

[Plant disease work by the Wyoming Station] (*Wyoming Sta. Rpt. 1938, pp. 5, 6, 7*).—Brief reports are included on studies of cottonwood chlorosis treatment by ferric phosphate, bacterial bean blight, dry rot of potato, pea seed treatment, and selection and breeding of alfalfa for resistance to bacterial wilt.

Insoluble copper fungicides, A. A. Nikitin (*Tenn. State Hort. Soc. Proc., 34 (1938), pp. 94–97, pls. 3*).—The development and use of modern insoluble copper fungicides are reviewed, with 15 bibliographic footnotes.

Root development in relation to root rots of cereals, P. M. SIMMONDS (*Sci. Agr., 19 (1939), No. 7, pp. 475–480*).—From interpretations based largely on studies of take-all, browning root rot (*Pythium* associated), and common root rot (*Helminthosporium sativum* and *Fusarium* spp.) in Saskatchewan, the prime importance of the state of health of cereal seeds is pointed out. In the seedling stage, especially in wheat, the plants are supported entirely by the seminal roots. Root infections during this period are shown to be responsible for much injury, usually accompanied by distinct shoot symptoms. Infections of the crown, crown roots, and tiller buds are considered in relation to post-seedling invasion, the damage here being particularly severe when the seminal roots also are infected. The seminal and crown roots are shown to play important roles in the growth of the plant, the former penetrating deeply and reaching the subsoil moisture early in the season and remaining functional as long as the plant lives, while the crown roots support any increase in growth when the tillers develop. Root rot infections are compared to artificial injuries to both root systems, the reactions being comparable in many respects. Observations are also made from physiological and pathological angles on the possibilities of developing a wheat plant supported entirely by the seminal roots. There are 17 references.

Coprinus urticaecola on stems of Marquis wheat, W. F. HANNA (*Mycologia, 31 (1939), No. 3, pp. 250–257, figs. 2*).—*C. urticaecola* was observed at Winnipeg on Marquis wheat (1934), the fruit bodies being attached near the ground to leaf sheaths of green plants. Later (1937) it was collected on decaying nettle stems. It is considered identical with *C. brassicae* and with *C. phaeosporus* Karst. *sensu* Lange. The fungus grew readily on potato-dextrose agar and fruited on a number of sterile media. However, fruit bodies failed to develop when wheat plants in the greenhouse were inoculated with mycelial cultures. The fungus characters are discussed and illustrated.

Observations on stem rust of wheat in Mexico during the month of February 1938 [trans. title], **E. C. STAKMAN, W. L. POPHAM, and R. C. CASELL** (*Agricultura [México, D. F.], 2 (1939), No. 10, pp. 3–5*).—Field observations in various parts of Mexico on *Puccinia graminis tritici* and identification of physiological races, including a list of those collected with localities.

Shrivelling of wheat kernels by stem rust and its effect on seed value, H. W. MEAD (*Sci. Agr., 19 (1939), No. 7, pp. 481–493, figs. 2*).—The dry weights of embryos of kernels shriveled by stem rust proved to be 41.6, of fiber 57.1, and of endosperm 37 percent of those of normal kernels, indicating that the formation of endosperm tissue tends to be retarded by rust more than that of any other kernel tissue. Shriveled wheat germinated almost as well in the laboratory as normal wheat, but planted in soil it produced fewer and weaker seedlings, these weak plants emerging later, having smaller root systems, and being lighter in weight. The low vigor of seedlings from shriveled wheat was reflected in their poor resistance to common root rot, and greater permanent damage was done to them by severe top injury. However, these weak seedlings withstood freezing and prolonged drought as well as normal seedlings. Formalin treatment of shriveled wheat caused serious reductions in germination and emergence, and appeared to make the seedlings very susceptible to common root rot. On the other hand, treatment with New Improved Ceresan or Leytosan proved very slightly beneficial. Despite the apparent weakness of plants from shriveled wheat, good stands and yields were obtained in field tests (1936), and the results here reported were corroborated by a provincial survey of areas where shriveled wheat had been sown.

Seed corn treatments, C. M. Haenseler (*New Jersey Stas. Cir. 384 (1939), pp. 3*).—This is a discussion of the threefold action of and practical directions for fungicidal treatments of seed corn.

The relation of moisture and temperature to growth of the cotton root rot fungus, C. H. Rogers. (Tex. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 9, pp. 701–709, figs. 2*).—*Phymatotrichum omnivorum* mycelial strands grew in Houston black clay soil under soil moistures of 15–35 percent (oven-dry basis), the optimum being ±25 percent. or 35 percent of the maximum water-holding capacity. Sclerotia developed at soil moistures of 15–30 percent, but neither sclerotia nor mycelial strands grew at or below 8 percent or above 35 percent. Both developed in constant-temperature water baths at 11°–37° C., the optimum for each being ±27°. At the lowest temperature used (3°) there was no active growth, but the fungus was apparently not injured. At 39° and above, the fungus died. At the lower temperatures both sclerotia and mycelia were whitish-amber in color, and at the minimum temperature for growth this color was retained throughout the experiment. At higher temperatures both sclerotia and mycelia were formed with the usual dark color of maturity in the field. Both strands and sclerotia were rapidly killed by high temperatures or drying, such as occur under ordinary summer conditions in the field. Moisture is said to be the limiting factor during the growing season, intermittent rains of sufficient quantities causing rapid spread of the fungus, with death of a large portion of the cotton plants by the end of the season.

Dusting Spanish peanuts with sulphur, N. C. Woodroof and B. B. Higgins (*Georgia Sta. Cir. 117 (1939), pp. 12, figs. 5*).—In the tests here reported dusting with sulfur increased the yield of both peanuts and hay, controlled the spread of *Cercospora* leaf spots, prevented excessive shedding of leaves, and improved the quality of the hay. Three treatments with 325-mesh sulfur are recommended at 2-week intervals, beginning 60–65 days after planting, applying early in the morning or late in the afternoon, and using 45–55 lb. per acre for the season. Fertilizer top dressings as supplements to the dusting program are suggested.

Bacterial wilt and soft-rot of the potato, R. Bonde. (Maine Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 5, pp. 109–114, figs. 3*).—This disease, found in Canada in 1931 and in Maine in 1932, has since been reported from Pennsylvania, Florida, and Wyoming, and according to Burkholder the Maine disease, at least, is due to *Phytomonas sepedonica* (E. S. R., 80, p. 209). Since the malady presents a potentially serious problem, the author describes and illustrates the symptoms to aid in detecting it. Studies in Maine appear to indicate that it is not overwintered in the soil but rather in the seed tubers. Its increase may be very rapid in the field, and circumstantial evidence suggests soil water as the disseminating agency here. It is claimed on experimental data that the disease cannot be eliminated by tuber examination during seed cutting or by roguing and seed plat methods, but partial control has been secured by planting whole seed tubers, thus preventing spread in cutting and handling. The only practical control is use of disease-free seed, the effectiveness of which has been shown (1937-38). Obviously prompt and reliable diagnosis is a necessity, and the smear-staining method of Racicot et al. (E. S. R., 80, p. 500) is recommended.

Controlling common scab of the potato on Long Island by the addition of mercury compounds to the fertilizer mixture and the relation of soil reaction to the treatment, H. S. Cunningham and P. H. Wessels (*New York State Sta. Bul. 685 (1939), pp. 20*).—On the basis of investigation

and statistical analysis of the effect of adding mercury compounds to the fertilizer mixture and of the relation of soil reaction to fertilizer-mercury combinations, it is concluded that under Long Island conditions 4 lb. of either yellow oxide of mercury or calomel to each ton of fertilizer mixture will reduce the amount of scab on soils at pH 5.5 or below. Larger amounts give no more effective control and may result in decreased tuber yields. The yellow oxide proved more effective than calomel.

Potato scab and its control, L. J. Wheeler. (Mich. State Col.). (*Ind. State Veg. Growers' Assoc.,* [*Ann. Rpt.*], *10* (*1939*), *pp. 50–62*).—A semipopular account summarizing data on relative varietal susceptibility and control tests by seed treatment, which have given poor results. The importance of clean seed and clean slightly acid soil is emphasized.

Varietal resistance of potatoes to the effects of eelworm infestation, D. Robertson (*Scot. Jour. Agr., 22* (*1939*), *No. 2, pp. 172–174*).—In the experiment reported, evidence was obtained that the variety Epicure can produce a surprisingly high yield in soil heavily infested with cysts of *Heterodera schachtii*. Whether or not this result was due to the discovery of a strain resistant to the effects of nematode invasion, the matter is deemed worthy of further investigation.

Chlorotic streak, C. W. Edgerton. (La. Expt. Sta.). (*Sugar Bul., 17* (*1939*), *No. 14, pp. 1, 2*).—This is a brief report on the present known distribution of this sugarcane disease in Louisiana, on the promising results of seed treatment tests (especially hot water), and on suggested important lines of study regarding spread, effect on cane, varietal resistance, and roguing.

Seed selection and roguing in the practical control of mosaic disease of sugarcane in Louisiana, M. L. Shaffer (*Louisiana Sta. Bul. 308* (*1939*), *pp. 8*).—The results of experiments here reported appear to indicate that a combination of seed selection and roguing is practical for cane mosaic control. In these tests, the amount of spread in Co. 281 and Co. 290 varied with the amount of infection in the cane used for seed, while there was very little spread in C. P. 28-19, C. P. 29-116, and C. P. 29–320. The most roguing was required by Co. 281, the average percentages rogued for 2 yr. being 7.7 and 9.3, respectively. Less roguing was required for Co. 290, the averages being 4.1 and 3.7. The less susceptible varieties (C. P. 29–320, C. P. 28–19, and C. P. 29–116) required very little roguing to keep them mosaic-free. The 2 years' work indicated that cane with very little infection can be grown at a reasonable cost in practically any part of the cane belt by careful seed selection, proper isolation of seed plats, and thorough, adequately supervised roguing. To be effective the roguing should begin as early as possible in spring and continue until late summer.

Tobacco diseases in 1938, P. J. Anderson (*Connecticut* [*New Haven*] *Sta. Bul. 422* (*1939*), *pp. 26–42, figs. 9*).—This is a seasonal survey of incidence, with salient points and control tests and suggestions, with reference to downy mildew, recurrence of wildfire, hollow stalk, root rots, malnutritional disorders, ammonia injury in the seedbeds, blackfire in the seedbeds, bed rot due to *Pythium aphanidermatum*, blackleg (a bacterial bed rot), control of damping-off and bed rot by vapors of benzol and paradichlorobenzene, and *Fusarium* leaf blotch (or scab).

The physical chemistry of tobacco mosaic virus protein, M. A. Lauffer and W. M. Stanley (*Chem. Rev., 24* (*1939*), *No. 2, pp. 303–321, figs. 9*).—This critical review (57 references) deals with the shape and size of the tobacco mosaic virus protein particles, including optical, ultracentrifugation, viscosity, diffusion, rotational diffuson coefficient, filtration, X-ray, and adsorption studies; and further physicochemical studies, including the absorption spectrum, surface spreading, electrophoretic behavior, and changes due to pH effects.

The amino acids of tobacco mosaic virus protein, A. F. Ross and W. M. Stanley (*Jour. Biol. Chem., 128 (1939), No. 3, pp. LXXXIV, LXXXV*).—An abstract.

Investigations and observations on the "necrotic virus" in relation to the fungus Thielavia basicola [trans. title], J. Szirmai (*Phytopathol. Ztschr., 12 (1939), No. 2, pp. 219–227, figs. 7*).—The author reports an association of the necrotic virus of tobacco, the virus-containing cells, and the fungus *T. basicola*.

Soil studies on the causes of the brown root rot of tobacco, E. D. Matthews, C. A. Reneger, and R. P. Thomas. (Md. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 9, pp. 673–684, figs. 2*).—The authors studied the chemical and biological soil factors associated with the field occurrence of the disease, including the nitrate-N, water-soluble P, cellulose, and C content of the soils and the isolation of *Sclerotium bataticola* from affected roots and from the soil around them. From the results of this work, it was found that the fungus is readily destroyed by air-drying, that it decomposes cellulose, and that it grows better in neutral to alkaline media, characteristics apparently in accordance with the field conditions influencing the occurrence and severity of the disease. Finally, in inoculation tests under controlled greenhouse conditions, *S. bataticola* induced symptoms typical of brown root rot of tobacco.

Web-blight, a disease of beans caused by Corticium microsclerotia, G. F. Weber. (Fla. Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 559–575, figs. 7*).—*Rhizoctonia microsclerotia* was discovered in Florida in 1932 causing a destructive disease of beans, epidemics in bean fields occurring at scattered locations in the State during the warm, rainy summer weather and at such times causing total losses in extensive plantings. The aerial parts of the host alone are attacked and killed. This disease, designated as "web-blight," has not previously been reported on beans in the United States. It causes brown spots on the leaves, rapidly killing them. The pods become spotted as in anthracnose and rapidly deteriorate. Petioles and peduncles are also attacked. The characteristic sclerotia on diseased plants are an important diagnostic symptom, and they may remain viable for at least a year, constituting the primary type of inoculum for the spread of the disease. In culture, optimum growth occurred at pH 6, with some at pH 3 and 9. The cardinal temperatures were 15°, 29°, and 33° C. It is extremely pathogenic on many vegetable plants under optimum conditions, and is shown to be capable of parasitizing a wide range of crop and wild plants, both annual and perennial. The basidiospore stage is described as *C. microsclerotia* n. comb.

Tests of new dust and liquid fungicides in 1938 for control of celery leaf blights, R. Nelson (*Michigan Sta. Quart. Bul., 21 (1939), No. 4, pp. 295–307*).—Cuprocide-sulfur-talc dusts gave superior control of leaf blights in three plantings of celery at Comstock, having smoother flowing properties and covering the foliage better than any materials previously tested. Basicop-sulfur-talc and Bordow-sulfur-talc dusts were less satisfactory but about equal in effectiveness to copper sulfate-lime and copper sulfate-lime-talc combinations. Bordeaux 8–12–100 and 8–6–100 controlled leaf diseases without perceptible foliage injury more effectively than the copper fungicides of low solubility, all of which caused sufficient injury to reduce yields. Grasselli Copper A was effective but caused foliage injury which was reflected in lower yields than in the bordeaux plats. Hydrated lime or zinc sulfate failed to prevent foliage injury by Basicop sprays.

A Pythium root rot of cucurbits, M. Gottlieb and K. D. Butler. (Univ. Ariz.). (*Phytopathology, 29 (1939), No. 7, pp. 624–628, fig. 1*).—A watery root and fruit rot of watermelons, honeydew melons, quil muskmelons, and crookneck squashes occurring spontaneously in Arizona proved to be due to *P. aphani-*

dermatum, also shown to be capable of inducing a rapid decay of many other fruits and vegetables. Root infections followed inoculations in both greenhouse and field, and the fungus was able to penetrate uninjured root and fruit tissues in practically all cases studied. Detailed data on the growth and reproduction of the fungus on various media are reported. The optimum for mycelial growth was 37° C. Sporangial production was meager and transient, being induced only with difficulty in various fluid media at pH 5.4. Oogonia and oospores were produced in great but varying abundance in both greenhouse and field and on various inoculated fruits and vegetables.

Host-parasite relationships in pink root of Allium cepa L.—I, The pigment of Phoma terrestris, W. A. KREUTZER. (Colo. State Col.). (*Phytopathology, 29 (1939), No. 7, pp. 629–632*).—In Colorado, onion roots invaded by the pink root pathogen *P. terrestris* did not always show the usually associated pink-red root coloration, but were occasionally yellow to yellow-brown. Cultural studies indicated that although temperature and nutrient variation had little to do with this phenomenon, increasing the *H*-ion concentration produced a color change, the hue induced being comparable to that observed in nature. In preliminary trials with diseased pink roots and agar mats on which the fungus was growing, a color shift occurred from red to red-purple shades at pH 8.5 to a yellow to yellow-brown at pH 4.5. By extracting the fungus pigment with 0.1 N HCl followed by 0.1 N NaOH, it was obtained in a soluble state. Using the pigment in solution, a more sensitive test was obtained, the color shift occurring at pH 7–7.86. The pigment was obtained from its alkaline solution by adding saturated Na_2SO_4 and was returned to its soluble state only by treatment with 0.1 N HCl followed by 0.1 N NaOH. Since the material apparently is hydrolyzed by emulsion, it appears that at least part of the molecule is of the nature of a β-glucoside

White rust of spinach, J. S. WIANT, S. S. IVANOFF, and J. A. STEVENSON. (U. S. D. A. and Tex. Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 616–623, figs. 2*).—This rust was first noted in March 1937 on the New York market in shipments from the Winter Haven region of Texas, and was destructive throughout this area during 1937-38. Following detailed taxonomic comparisons, the pathogen is assigned to *Albugo occidentalis*. There are 25 literature references.

Fire blight and its control, E. M. HILDEBRAND (*N. Y. State Col. Agr., Cornell Ext. Bul. 405 (1939), pp. 32, figs. 23*).—This is a popular compendium of present information on this bacterial disease of pome fruit trees and its control.

Evaluating orchard spray materials: A progress report, C. E. PETCH (*Sci. Agr., 19 (1939), No. 7, pp. 424–434*).—In this attempt to evaluate some phases of the spraying problem hitherto receiving but little attention, the data presented indicate that an increase in crop production (apples) may be correlated with increases in bud growth, twig growth, and ash content of the leaves, and that the differences in these factors may be due to the different fungicides applied. It is believed that the best criterion for determining the value of fungicides and insecticides is the weight of marketable and clean fruit. It is brought out that there should be an evaluation of spray materials in relation to tree growth, foliage development, and total crop production in addition to the protection to the fruit. There are 29 references.

Recent developments in fungicides for the control of peach and apple diseases, R. H. HURT. (Va. Expt. Sta.). (*Pa. State Hort. Assoc. Proc., 80 (1939), pp. 13–17, 19, 20*).—Recognizing the general conclusion that different growing conditions exist each year and that varieties of peaches and apples respond no 2 yr. alike to a standard spray schedule, the author discusses the spraying problems in the light of the latest experiences relative to the dormant

pray, spring and summer sprays, arsenical injury, sulfur fungicides, pre-arvest spray for brown rot, dusting on the grading equipment for peaches, nd fungicides for apple disease control including those containing copper or ulfur.

Apple fungicide schedule for 1939, H. W. ANDERSON. (Univ. Ill.). (*Ill. tate Hort. Soc. Trans., 72 (1938), pp. 376–385*).—Current recommendations for ne official fruit spray schedule are summarized.

Secondary diseases of the apple, H. W. ANDERSON. (Univ. Ill.). (*Ill. tate Hort. Soc. Trans., 72 (1938), pp. 168–177*).—This is a summary of data on iseases (bitter rot, rusts, sooty blotch, and frog-eye leaf spot) which at times ust be considered in the spray schedule due to serious losses caused by them n some seasons. The spray schedule is designed more for the primary diseases nd insects and certain modifications are necessary to avoid excessive spray njury, but such modifications sometimes result in unexpected lack of control f secondary diseases. In such cases it may be necessary to use less effective aterials for the control of primary diseases and pests in order to care for the emergency.

Causes of premature defoliation of sour cherry, E. J. RASMUSSEN. (Mich. State Col.). (*Oreg. State Hort. Soc. Ann. Rpt., 30 (1938), pp. 131–135*).—In this address the author points out some of the characteristics of the various types of injury found to cause defoliation in Michigan (viz. fertilizer treatment, drought injury, leaf spot and physiological yellow leaf, insect injury, and spray injury), with recommendations for their control.

Basicop as a cherry spray in 1938, C. W. ROBERTSON and D. CATION (*Michigan Sta. Quart. Bul., 21 (1939), No. 4, pp. 291–295, fig. 1*).—Spray tests in 1938 are reported to have given results essentially similar to those of 1937 (E. S. R., 79, p. 645). Liquid lime-sulfur (2.5–100) in the recommended 4-spray program failed to give adequate control of the *Coccomyces hiemalis* leaf spot in either year. The tendency to fruit dwarfing and foliage injury again indicates a 4-spray program for bordeaux mixture (6–8–100) to be unsatisfactory for cherries in Michigan. Cupro K gave good control but injured the leaves severely. Basicop (3–8–100, and 3–6–100) has given good control and but little perceptible injury, but without added lime or $ZnSO_4$-lime it has been unsatisfactory because of foliage injury. At 1.5–100 Basicop failed to give adequate control of leaf spot. A 4-spray program of Basicop-$ZnSO_4$-lime at 2–1–1.5–100 showed definite promise as a cherry spray, in limited experiments giving adequate control with no foliage injury.

Recent advances in our knowledge of bacterial spot of peach, H. W. ANDERSON. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 72 (1938), pp. 479–488*).—It is concluded from this review of recent studies that at present there seems to be no effective method of controlling bacterial spot. Certain points in the life history of the organism (*Phytomonas pruni*) have been cleared up and additional lines of attack are being tried out, including breeding and selection for resistence.

Progress in peach mosaic control, 1937–1938, B. M. GADDIS. (U. S. D. A.). (*Calif. Dept. Agr. Spec. Pub. 166 (1938), pp. 57, 58*).—The high lights at the close of 1937 embraced the inspection of over 3,500,000 peach trees on over 44,000 properties, in 185 counties in 9 southwestern States, during which over 74,000 diseased trees were located on nearly 5,000 properties. The annual reduction in diseased trees in most areas was generally proportionate to the percentage of diseased trees promptly removed during the previous year. The 1938 program covering all known infected States is briefly discussed.

Brown rot of peaches in transit and storage, R. S. WILLISON (*Sci. Agr., 19 (1939), No. 7, pp. 458–474, figs. 6*).—Long distance shipping tests with

Rochester and Elberta peaches indicated that while the riper grades were more susceptible to *Sclerotinia fructicola* rot than the green, its incidence in the riper fruits may be delayed long enough to permit marketing. The later harvested fruits of both varieties were somewhat more susceptible to rot than the first pickings of the season. A number of forms of wettable sulfur were tested and, in general, those sprays appliable immediately before harvesting gave more uniform results than those which had to be applied 2–3 weeks earlier. Sulfur dusting also proved satisfactory except when it rained before harvest. Wastage as bruises and to a lesser extent as rots was reduced by care in handling operations. The incidence of rot was usually much higher when peaches were cooled after a 24-hr. delay than when this was done shortly after picking. Where cars were iced only on departure there was little difference in the development of rot in treated v. untreated peaches. There are 27 references.

Progress of zinc sulphate sprays and zinc sulphate and boron combinations for little leaf control at The Dalles, Oregon, O. T. McWhorter (*Oreg. State Hort. Soc. Ann. Rpt., 30 (1938), pp. 68–70*).—A brief progress report on work with little leaf of stone fruits.

Rust on the California native Pruni, C. O. Smith and L. C. Cochran. (Calif. Citrus Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 645, 646, fig. 1*).—*Tranzschelia pruni-spinosae* developed spontaneously on the following native California species of *Prunus* in a mixed planting: *P. andersonii*, *P. subcordata*, *P. fasciculata*, and *P. fremontii*. *P. emarginata* was infected artificially, while *P. demissa* and *P. ilicifolia* were not infected. This is believed to be the first report of this rust on wild species of *Prunus* in California.

Some recent observations on the red stele disease, J. H. Clark (*N. J. State Hort. Soc. News, 20 (1939), No. 4, pp. 1131, 1132*).—Seasonal field notes in New Jersey, relating to this strawberry disease.

Yellows resistant Blakemore strawberries, R. R. McUmber (*Tenn. State Hort. Soc. Proc., 34 (1938), pp. 97–99*).—The origin of this resistant variety is given.

Susceptibility of seedlings of Ribes punctatum, and Andine currant, to Cronartium ribicola, G. G. Hahn. (U. S. D. A. et al.). (*Phytopathology, 29 (1939), No. 7, pp. 643, 644*).—Little is known as to the susceptibility of South American species of *Ribes* to *C. ribicola*, and so far as known the susceptibility of *R. punctatum* is here reported for the first time. It is believed that this tender evergreen, dioecious species would prove useful as a source of inoculum for greenhouse studies of the fungus during late fall and winter, when North American and European species of Ribes have lost their leaves.

Studies on filbert blight and its control: Second report of progress, P. W. Miller. (U. S. D. A. and Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt., 30 (1938), pp. 166–171*).—This bacterial disease (E. S. R., 77, p. 807). is said to have been very prevalent and destructive in the Pacific Northwest in 1938, causing losses of 5–35 percent of the trees in young orchards up to 3 yr. old and an estimated indirect loss of 10–25 percent of the nut crop in the older orchards. This severity was associated primarily with the preceding abnormally rainy fall and winter. Disease development in 1938 occurred during the spring, its peak being reached late in April, while by early summer its development was largely over. The incidence of bud and twig blight in bearing orchards was reduced to traces by three applications of bordeaux mixture (4–2–50) in late summer, late fall, and early spring. The most important single spray was apparently the one made in late summer, and the least important the one of early spring. The net results obtained seem to indicate that in average western Oregon seasons the incidence and severity of bud and twig

blight in bearing orchards can be reduced to a negligible amount by a late summer or early fall bordeaux (4–2–50) treatment before the first fall rains appear. However, if the critical infection period is abnormally rainy, as many as three applications may be necessary, viz. (1) in late summer or early fall before the first fall rains, (2) in late fall when the leaves are about half off, and (3) in early spring when the leaf buds are opening and the green leaf tips are showing.

A promising new copper spray for the control of walnut blight, P. W. MILLER. (U. S. D. A. and Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt., 30 (1938), pp. 148–151*).—The results of the studies described (1935–38) appear to indicate that copper oxalate (1.5–2–50) is more effective under Oregon conditions for controlling bacterial blight of walnut than bordeaux mixture (2–2–50). Unlike the latter it is noninjurious to walnut leaves.

Nematodes observed on diseased rhizomes of ginger from Peru, G. STEINER and J. R. CHRISTIE. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 6 (1939), No. 1, pp. 26–29, fig. 1*).—*Diploscapter coronatus*, *Neocephalobus peruensis* n. sp., and *Aphelenchoides hunti*, found on diseased rhizomes of *Zingiber* sp., are here added to the nematode fauna of Peru.

Bacteriosis of tuberous begonia, P. A. ARK and C. M. TOMPKINS. (Univ. Calif.). (*Phytopathology, 29 (1939), No. 7, pp. 633–637, figs. 2*).—A leaf spot of *Begonia tuberhybrida* in lathhouse nurseries in California under high humidity and relatively high temperature conditions is reported. When inoculated with pure cultures of the pathogen, 12 species and varieties of begonia proved susceptible. Air humidity and temperature control are recommended for minimizing the injury from this bacteriosis. The pathogen was diagnosed as *Phytomonas begoniae* and compared to *P. flavozonatum*, with which it is considered identical. The former, and earlier, name is preferred.

Factors affecting iron chlorosis in gardenias, H. E. WHITE. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 774–780, figs. 3*).—When severe, iron (Fe) chlorosis is said to become a limiting factor in the growth of gardenias. Chlorotic foliage became green when treated with Fe compounds but failed to respond to other so-called minor elements. In soil, the corrective effect of Fe compounds was very slow and no response to other minor elements was noted. Fertilizers containing $NaNO_3$ or $Ca(NO_3)_2$ induced Fe chlorosis, organic or ammonia sources of N in fertilizers prevented it, and P and K had no influence on it. Sulfur in amounts as low as 0.5 lb. per 100 sq. ft. of bench area prevented Fe chlorosis, and the chlorotic-inducing effect of Na and Ca was inhibited by S. On experimental evidence, conditions other than soil acidity would appear to be contributing factors where this chlorosis is concerned. Supplementary illumination in winter failed to reduce the trouble. Growing gardenias at 50° F. resulted in a chlorosis not corrected by Fe applications and not responding to ammonia forms of N. Diseases such as nematodes and stem canker accentuated the Fe chlorosis symptoms.

Bulb nematode control in iris by hot water, R. J. HASTINGS, J. E. BOSHER, and W. NEWTON (*Canad. Jour. Res., 17 (1939), No. 5, Sect. C, pp. 144–146*).—"The immersion of iris bulbs in water at 110° to 112° F. for 60 min. effectively destroys the bulb nematode. The safe period for nematode destruction in iris by hot water lies between July 26 and August 9. Thereafter injury to the bulbs occurs and is progressively greater as the immersion dates are delayed."

Two species of Hysteriales on smilax, E. K. CASH. (U. S. D. A.). (*Mycologia, 31 (1939), No. 3, pp. 289–296, figs. 2*).—*Hypodermopsis smilacis* n. comb. and *Gloniopsis ellisii* n. nom. are described, illustrated, and discussed. "The superficial resemblance of these two species and their growth on the same host has led to mixed collections, apothecia of both fungi being sometimes present

on the same stem, only a few centimeters apart. . . . An added source of confusion is the fact that some descriptions appear to combine characters of both fungi under a single name."

Studies on control of tulip blight, A. T. Guard. (Purdue Univ.). (*Ind. Acad. Sci. Proc., 53 (1937), p. 73*).—An abstract.

Diseases of ornamental plants, P. P. Pirone (*New Jersey Stas. Cir. 385 (1939), pp. 80, figs. 65*).—After brief introductory statements on the nature of parasitic agents and on plant disease control, this compendium, a revision of Circular 226 (E. S. R., 65, p. 352), takes up in turn the specific diseases of box, calla, carnation, China-aster, chrysanthemum, dahlia, delphinium, geranium, gladiolus, hollyhock, iris, ivy, laurel, lilac, lily, peony, phlox, rhododendron, rose, snapdragon, sweet pea, and tulip. Being more or less omnivorous in attack, damping-off of seedlings, winter injury of evergreens, mosaics, rusts, mildews, and nematodes are also discussed separately, with lists of plants commonly concerned. Fungicides and soil sterilization or pasteurization each have a brief section, and an index is provided.

Diseases of nursery plants, M. A. McKenzie. (Mass. Expt. Sta.). (*Amer. Nurseryman, 68 (1938), No. 7, pp. 3, 4*).—A brief summary of pertinent data on infectious and noninfectious diseases of evergreen and deciduous nursery trees in the open.

Spray trials on ornamental red cedars, F. C. Strong and E. J. Rasmussen (*Michigan Sta. Quart. Bul., 21 (1939), No. 4, pp. 277–279*).—In nurseries and ornamental plantings of *Juniperus virginiana* with hawthorns, flowering apples, and crab apples, the increasing importance of the rust diseases due to *Gymnosporangium* spp. is stressed. In such cases planting of the alternate hosts a mile or more distant is impractical, and many of the favorite landscape varieties are very susceptible. Since at least 12 mo. must elapse after infection before the cedar galls become visible it was impossible to determine the control effects of the preliminary spray trials with wettable sulfur here reported, and since the 1938 weather conditions were unfavorable for sulfur spray injury definite conclusions could not be drawn as to possible foliage injury by wettable sulfur. However, the soybean oil sticker used in some of the tests caused distinct foliage injury on two varieties. Other combinations with stickers (soybean flour and Orthex) and wettable sulfur alone gave no apparent injury.

Leafspot of ash and Phyllosticta viridis, F. A. Wolf (*Mycologia, 31 (1939), No. 3, pp. 258–266, figs. 14*).—The leaves of several *Fraxinus* species may be infected by a *Phyllosticta* commonly identified as *P. viridis*, a fungus widely distributed in the United States east of the Rocky Mountains. Leaf lesions form in late summer, and severe defoliation may result. The black stromata protruding from the lower leaf surfaces aid in diagnosis. At this stage they contain both spermogonial and carpogonial locules, the former said to be identical with *P. viridis*. The carpogonial locules become transformed by early spring into mature perithecia, this stage being identified as *Mycosphaerella fraxinicola*. The ascospore discharge period extends into early summer, and infection is first apparent by the presence of stromata. Present evidence indicates there is no conidial stage.

Chestnut breeding work in 1938, A. H. Graves (*Brooklyn Bot. Gard. Rec., 28 (1939), No. 2, pp. 55–60, fig. 1*).—This is a progress report on work directed toward the development of a new chestnut resistant to *Endothia parasitica* to replace the now nearly extinct American chestnut. Cooperative assistance and plantings, a summary of new hybrids, and a list of chestnut species, varieties, and hybrids growing at Hamden, Conn., October 1938 are given.

Studies on Polyporus abietinus.—III, The influence of certain factors on the rate of decay of loblolly pine sapwood, K. H. Garren (*Jour. Fores-*

Agr. 37 (1939), No. 4, pp. 319–323, fig. 1).—In further studies (E. S. R., 80, p. 507) a statistical analysis of the results of decay in *Pinus taeda* sapwood showed that both specific gravity and moisture content are significant in determining the rate, the indications being that the higher the specific gravity the greater will be the resistance to sapwood decay by this fungus.

White pine blister rust in Wisconsin, E. L. Chambers and T. F. Kouba. (U. S. D. A.). (*Wis. Dept. Agr. and Markets Bul. 204 (1939), pp. 35–48, figs. 7*).—This is a bulletin of information on the value of white pine in Wisconsin, the distribution and present status of blister rust in the State, and other pertinent data on the recognition and control of this disease.

Principal decays of softwoods used in Great Britain, K. St. G. Cartwright and W. P. K. Findlay (*London: Dept. Sci. and Indus. Res., 1938, pp. 106, pls. [17], figs. [4]*).—This is the second in a series of publications (E. S. R., 78, p. 213) dealing with the fungi causing decay in the principal commercial timbers. While the diseases of home-grown conifers are here dealt with in greater detail, the principal types of rot and "dote" commonly found in softwoods imported from northern Europe and America are also described. The economic importance of the different types of decay are indicated, but the silvicultural aspects of the rots of standing conifers are referred to only briefly.

Attractiveness of roots and excised shoot tissues to certain nematodes, M. B. Linford. (Hawaii. Pineapple Producers' Expt. Sta.). (*Helminthol. Soc. Wash. Proc., 6 (1939), No. 1, pp. 11–18, figs. 2*).—Microscopic observations indicated that *Heterodera marioni* larvae congregate around roots and move down to the elongating zone just behind the root cap. Larvae and females of *Pratylenchus pratensis* and *Rotylenchus multicinctus* congregated more slowly around the roots and remained in the mature root zone, where they penetrated and fed. *Aphelenchus avenae*, reared in agar-fungus cultures, exhibited but little grouping around the roots. Pieces of fresh tissue cut from green leaves and stems of diverse plants proved strongly attractive to *H. marioni* larvae and remained attractive as they decomposed. More limited tests indicated that *R. multicinctus* likewise responds to green tissues but that *A. avenae* does not. *H. marioni* larvae in agar congregated around yeast colonies over which glass cover slips had been placed, indicating either an attraction or a trapping by the mechanism of retarded locomotion through anaerobiosis.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wildlife Review, [January–May 1939] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Rev. Nos. 18 (1939), pp. 33; 19, pp. 36; 20, pp. 36; 21, pp. 32*).—A continuation of this series (E. S. R., 80, p. 650).

Wildfowl food plants: Their value, propagation, and management, W. L. McAtee (*Ames, Iowa: Collegiate Press, Inc., 1939, pp. IX+141, figs. [21]*).—The chapters of this work deal, respectively, with productivity, value, and utilization of wildfowl food plants; wild-duck food plants by families; environmental limitations on the growth of aquatic plants; planting suggestions; construction of ponds; control of undesirable plants and animals; and vernacular names of wildfowl food plants. A list of 37 references to the literature and an index are included.

Wildlife mortality on Iowa highways, T. G. Scott. (Iowa Expt. Sta., coop. U. S. D. A. et al.). (*Amer. Midland Nat., 20 (1938), No. 3, pp. 527–539*).—Observations of wildlife casualties on Iowa highways conducted from May 1936 to April 1937, inclusive, covering a rural distance of 2,944.1 miles distributed over 43 counties, are recorded, the details being given in 5 tables.

American bird biographies. [11], The golden plover and other birds, A. A. Allen (*Ithaca, N. Y.: Comstock Pub. Co., 1939, pp. XIII+324, pls. 7, [figs. 242]*). This second series of biographies (E. S. R., 77, p. 242) considers the life and habits of 27 additional forms. Seven colored plates by G. M. Sutton and 242 photographs of birds in nature by the author are included.

Food of game ducks in the United States and Canada, A. C. Martin and F. M. Uhler (*U. S. Dept. Agr., Tech. Bul. 634 (1939), pp. 157, pls. 153, figs. 137*). In this work the available information on waterfowl foods, including much recently gathered in field investigations, have been brought together by the authors. Part 1 (pp. 3-18) presents regional data on duck foods. Part 2 (pp. 19-101) considers the principal duck foods—their identification, value, and range. Part 3 (pp. 103-142) gives the propagation of waterfowl food plants and development of feeding grounds. Part 1 includes tables of data on the principal foods in eight regions of the United States and Canada. Within each region the figures on food use have been based on locality units, 247 in all, graded according to their representation by duck stomachs. Part 2 treats descriptively more than 200 food items in systematic order. The 123 test maps indicate the general known range of the plants and in many instances depict areas of greatest abundance, isolated occurrence, and districts of uncertain distribution. Part 3 presents practical suggestions on harvesting, storage, germination, shipment, and planting, and treats in some detail the principal factors, favorable and otherwise, influencing growth. A list is given of 91 references to the literature cited, and an index is included.

Food habits of North American diving ducks, C. Cottam (*U. S. Dept. Agr., Tech. Bul. 643 (1939), pp. 140, pls. 10, figs. 5*).—This bulletin treats of the food habits of the 22 North American diving ducks (exclusive of mergansers), which may be roughly segregated as inland divers and sea ducks. It is based both on field studies and on the analyses in the Food Habits Laboratory of the Bureau of Biological Survey of the stomach contents (including both gizzard and gullet) of 6,665 adults and 141 juveniles. For each species there is a summary of distribution, habits, and status, along with detailed data on food preferences.

The inland divers include the redhead, ringneck, canvasback, greater and lesser scaups, ruddy duck, and the masked duck. With the exception of the greater scaup, which consumes nearly equal proportions of plant and animal food, all are predominantly vegetarians, feeding on tubers, underground rootstalks, seeds, and green vegetative fibers of many aquatic and marsh plants. The sea ducks include the American and Barrow's goldeneyes, bufflehead, old squaw, and harlequin duck; the eiders—Steller's northern, American, Pacific, king, and spectacled—and the scoters—White-winged, surf, and American. All of these are predominantly animal feeders. For the inland divers, relatively few plants appear to be of outstanding value as food, but most important are the submerged pondweeds (Najadaceae), wildcelery (*Vallisneria spiralis*), muskgrass (Characeae), watershield (*Brasenia schreberi*), wildrice (*Zizania aquatica*), bulrushes (*Scirpus*), and smartweeds (*Polygonum*). The most important animal foods are mollusks and insects, particularly caddisfly and midge larvae, water bugs, and water beetles. A section of the bulletin treats of methods of propagating desirable duck foods. For the sea ducks, mollusks (mostly pelecypods, especially *Mytilus edulis*) were the most important food for eight species, crustaceans for four, and insects for two. Fishes are acceptable to all the species treated but were consumed in small numbers, and the kinds taken are rarely of commercial or sporting importance. It is concluded that, within limits, availability is the most important factor governing food selection. When an acceptable food is found the adults often

make their entire meal on a single or a related group of species. The young of most species fed principally upon animal foods, mainly insects, crustaceans and small mollusks, although some juveniles showed a decided, even though indiscriminate, preference for vegetable material.

A list is given of 97 references to the literature cited.

North Dakota hawks: Their value to agriculture, S. SAUGSTAD (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 5, pp. 14–19, figs. 21*).—This discussion of hawks of the State, in which the relative value of the species to agriculture is pointed out, includes a key for identification by wingspread dimensions and other marked characteristics.

The fall foods of ringneck pheasants and bobwhites, L. J. BENNETT and P. F. ENGLISH. (Pa. Expt. Sta., U. S. D. A., et al.). (*Pa. Game News, 10 (1939), No. 1, pp. 8, 9, 29, figs. 2*).—In this first report of cooperative work on fall foods, 74 percent of the volume of food in the crops of 423 pheasants consisted of crop seeds (corn and attendant weed seeds, including ragweed and foxtail), as did 81 percent of the volume of food in the crops of 61 bobwhites. "Sixteen percent of the pheasant food and 11 percent of the bobwhite food consisted of noncrop seeds and fruits from grape, dogwood, sourdock, and other plants. Animal matter, consisting mostly of grasshoppers, constituted 6 percent of the pheasant food and 5 percent of the bobwhite food. The volume of noncrop seeds and animal matter found in the crops of both pheasants and bobwhites was small. These foods, however, probably aid greatly in providing a balanced diet."

[**Notes on economic insects and their control**] (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 342–347, figs. 5*).—The contributions presented (E. S. R., 81, p. 237) are: *Micromyzus oliveri* Essig as a Greenhouse Pest, by C. F. Doucette (pp. 342, 343) (U. S. D. A.); Dryer and Protector for Insects, by A. R. Shadle (pp. 343, 344); Derris of High Rotenone Content, by H. A. Jones (p. 344) (U. S. D. A.); Methyl Bromide Injury to Apples, by W. R. Phillips and H. A. U. Monro (pp. 344, 345); Two Unusual Species of Aphids [*Rhopalosiphum splendens* (Theob.) and the Apple Grain Aphid] Infesting Wheat, by M. A. Palmer (pp. 345, 346) (Colo. Expt. Sta.); and Natural Foods of *Cochliomyia americana*, the True Screwworm, by A. L. Brody (pp. 346, 347) (U. S. D. A.)

[**Contributions on economic insects and insect control**] (*Phytopathology, 29 (1939), No. 1, pp. 9, 10, 12, 13*).—Among the contributions presented at the annual meeting of the American Phytopathological Society in Richmond, Va., in December 1938 are the following: Cultural Studies on a Species of *Entomophthora* From the Apple Leaf Hopper *Typhlocyba pomaria*, by J. G. Harrar, L. I. Miller, and S. A. Wingard (p. 9); Red Leaf Disease of Grapes in California Cured by Controlling Mites [*Tetranychus pacificus*], by W. B. Hewitt, H. E. Jacob, F. L. Proebsting, and J. F. Lamiman (p. 10); and The Relation of Copper Fungicides to Lead Arsenate-Lime and Fixed Nicotine-Oil Sprays, by K. J. Kadow, M. W. Goodwin, and S. L. Hopperstead (pp. 12, 13).

[**Contributions on economic insects**] (*Rev. Pathol. Vég. et Ent. Agr. France, 25 (1938), No. 2, pp. 85–93, 111–118, 144–155, 163–176, figs. 9*).—Contributions presented include the following: Use of Trap Bands in Control of the Codling Moth (*Laspeyresia pomonella* L.), by G. Viennot-Bourgin (pp. 85–93); Biology of *Bracon intercessor* Nees, Parasite of *Lixus* Enemies of the Sugar Beet in Morocco, by P. Bremond (pp. 111–118); The Coccids of Madeira—I, Diaspididae: Asterolecaniinae, by A. Balachowsky (pp. 144–155); Investigations of the Life Cycle of the Mealy Plum Aphid (*Hyalopterus arundinis* F.) on the Swiss Plateau, by W. Dill (résumé by R. Clausen) (pp. 163–172); and Control of the Cherry Maggot *Rhagoletis cerasi* in Gironde, by J. Bruneteau (pp. 173–176).

[Report of work in entomology by the New Haven Station]. (Partly coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul. 421 (1939), pp. 24-33, 45*).—The work of the year reported upon (E. S. R., 79, p. 359) relates to termite control (E. S. R., 79, p. 358), the oriental fruit moth, European red mite, adhesives for standard spray mixtures, oil sprays for control of the rosy apple aphid, substitutes for lead arsenate in orchard sprays, the pales weevil, the European pine shoot moth, onion thrips, European corn borer, squash bug, potato flea beetle, corn earworm, Japanese beetle (E. S. R., 79, p. 514), and, at the Tobacco Substation, control of the potato flea beetle, wireworms, and tobacco thrips on tobacco.

Report on the insect investigations for the 1938 season, A. W. MORRILL, JR., and D. S. LACROIX. (Coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul. 422 (1939), pp. 42-49, figs. 6*).—In reporting further progress (E. S. R., 79, p. 361), reference is made to experimental control work with the potato flea beetle and the tobacco thrips on shade tobacco, the potato flea beetle on sun-grown tobacco, flea beetle movement between tobacco and potato fields, the use of finely ground naphthalene and dichlorethyl ether in the control of the eastern field wireworm, insect losses sustained in sun-grown tobacco, and notes on the occurrence of tobacco insects, including the seed-corn maggot, the lesser migratory grasshopper (*Melanoplus mexicanus mexicanus* Sauss.), tobacco budworm, tarnished plant bug, tomato worm, tobacco worm, garden springtail, the spined stink bug (*Euschistus variolarius* Beauv.), dark-sided cutworm, and the spotted cutworm.

[Report of work in entomology by the Kentucky Station]. (Partly coop. U. S. D. A.). (*Kentucky Sta. Rpt. 1938, pt. 1, pp. 13-18*).—The work of the year reported (E. S. R., 79, p. 503) includes a May beetle survey; control of May beetle grubs; white grubs (*Phyllophaga ephilida, P. micans, P. crenulata, P. prunina, P. inversa, P. futilis,* and *P. hornii*) identified as strawberry pests; biology and control of the strawberry crown borer; the tomato fruitworm; oil-nicotine spray for control of plant lice on garden peas and roses and for tingids in the field; nicotine for control of poultry lice (the chicken body louse, the shaft louse *Menopon gallinae* (L.), the fluff louse, the large chicken louse, the wing louse *Lipeurus caponis* (L.), and the chicken head louse); studies of orchard insects, particularly the codling moth and the plum curculio; June beetle larvae in tobacco plant beds; sod webworm control; experiments with eight different strains of clover for resistance to pea aphid injury; tobacco wireworms; clipping for control of the corn earworm and other corn earworm studies; oriental fruit moth parasites; and trapping for the Japanese beetle.

[Work in entomology by the Massachusetts Station] (*Massachusetts Sta. Bul. 355 (1939), pp. 38-41, 53-65, pls. 3*).—The work of the year briefly reported (E. S. R., 79, p. 503) includes insects affecting the cranberry (the fire beetle *Cryptocephalus incertus* Oliv., the cranberry weevil, the Atlantic cutworm *Polia atlantica* Grote, and the cranberry fruitworm), by H. J. Franklin; oil sprays for dormant applications for control of the European red mite, substitutes for lime-sulfur in summer sprays for orchards, and apple maggot control, all by A. I. Bourne and W. D. Whitcomb; control of the white apple leafhopper, plum curculio, cabbage maggot on cabbages and radishes, striped cucumber beetle on cucumbers and melons, the squash vine borer, biology and control of the apple leaf-curling midge, and naphthalene and similar compounds as greenhouse fumigants, all by Whitcomb; the spray residue problem, introduction of parasites (*Macrocentrus ancylivorus*) of the oriental fruit moth in peach orchards, potato spraying experiments, control of onion thrips, and insecticides for the control of the European corn borer, all by Bourne; insects (the native elm bark beetle and the smaller European elm bark beetle) concerned in the dispersal

of Dutch elm disease, by W. B. Becker; and control of the red spider on greenhouse plants, by Whitcomb and W. Garland.

[Work in entomology by the Puerto Rico College Station] (*Puerto Rico Col. Sta. Rpt. 1938, pp. 33–44*).—The work of the year reported (E. S. R., 79, p. 650) includes the maintenance of a supply of the vedalia, predator of the cottony-cushion scale, by G. N. Wolcott and F. Seín, Jr.; a study of the dry-wood termite, or "polilla," *Cryptotermes brevis* Walk., control of the papaya scale by pressure spraying with water, control of *Sipha flava* Forbes (the yellow aphid of sugarcane), and an effective poison bait for the control of the hormiguilla *Myrmelachista ramulorum* Wheeler in coffee groves, all by Wolcott; effectiveness of various commercial miscible oils and other oil sprays in the control of the West Indian peach scale and the gray scale *Pseudoparlatoria ostreata* Ckll. on papaya trees, the control of the sugarcane borer by the egg parasite (*Trichogramma minutum* Riley), establishment of *Larra americana* Sauss. (a parasite of the changa in Puerto Rico), and forest tree insects, all by Wolcott and L. F. Martorell; and a study of the coffee leaf-miner *Leucoptera coffeella* Guer. and humidity as a factor in leaf-miner infestations, both by Seín.

[Report of work in entomology by the Wisconsin Station]. (Partly coop. U. S. D. A.). (*Wisconsin Sta. Bul. 443 (1939), pp. 34–43, 44–50, figs. 4*).—The work of the year reported (E. S. R., 79, p. 651) relates to codling moth sprays and factors influencing their use, such as proper timing, consistent and thorough application, and effect of road dust on areas sprayed, by J. A. Callenbach; importance of following spraying recommendations for codling moth control, promising modified oil sprays for leaf roller control, new information on grasshopper baits at Sturgeon Bay, and control methods for the strawberry leaf roller, all by J. H. Lilly; control of grasshoppers by the use of sawdust baits, by H. F. Wilson; control of cutworms by the use of baits, by L. D. Beadle and Wilson; white grub and June beetle infestations and control of June beetles by insecticides, by T. R. Chamberlin, L. Seaton, C. L. Fluke, and Callenbach; effect of atomized oil sprays on truck crops, by T. C. Allen and T. L. Carpenter; control of cabbageworms and cucumber beetles by rotenones, and alkaline carriers injurious to rotenone, both by Allen and J. W. Brooks; yields of canning peas in 1938 increased by the use of insecticides, by J. E. Dudley, Jr., and T. E. Bronson; studies to determine when pea aphid insecticides should be applied, by E. M. Searls and G. S. Hales; and factors affecting the control of the pea aphid by the use of rotenone dust, including influence of moisture, effect of temperature, amount of rotenone and type of machine used, and condition of the peas, by Wilson and C. E. Dieter.

Annual reports of the entomologist for the years 1935 and 1936, W. H. Edwards (*Jamaica Dept. Sci. and Agr., Ann. Rpts., 1935, pp. 76–80, fig. 1; 1936, pp. 57, 58*).—The occurrence of and control work with the more important insects of the two years are reported in continuation of earlier reports (E. S. R., 75, p. 806).

Insects of Brazil, A. de Costa Lima (*Insetos do Brasil. Rio de Janeiro: Escola Nac. Agron., 1939, vol. 1, pp. X+470, figs. 218*).—In this, the first part of a work on the insects of Brazil, 19 of 30 orders are considered in as many chapters, each of which includes a bibliography of the more important literature.

[Government of Northern Rhodesia, Veterinary Department, annual reports for the years 1935 and 1936] (*North. Rhodesia Vet. Dept. Ann. Rpts., 1935, pp. 35; 1936, pp. 76*).—Accounts of the occurrence of and control work with infectious diseases of livestock by J. P. A. Morris and H. S. Purchase are included in the 1935 report (E. S. R., 75, p. 104), and by J. P. A. Morris and P. L. le Roux in the 1936 report.

[Entomological work in the Sudan], H. W. Bedford (*Sudan Govt., Agr. Res. Serv. Ann. Rpt., 1936, pp. 38–52*).—This report relates particularly to a general survey of insect pests of crops in the Sudan and experimental work with cotton pests.

The development of applied entomology in Queensland, R. Veitch (*Roy. Soc. Queensland, Proc., 48 (1936), pp. 3–19*).—This presidential address reviews the progress of work in entomology in Queensland, with a list of 21 references to the literature.

[Insect pests of the cotton crop in Java], C. J. H. Franssen and H. R. A. Muller (*Landbouw [Buitenzorg], 14 (1938), No. 5–6, pp. 321–362, figs. 46; Eng. abs., pp. 361, 362*).—Some 28 species of insects that attack the cotton crop in Java are noted. Most of these are minor pests but 5 of them occasionally cause serious damage, namely, the weevils *Hypomeces squamosus* and *Amorphoidea pectoralis*, the spiny bollworm *Earias fabia*, the pink bollworm, and a leafhopper of the genus *Empoasca*.

[Contributions on fruit insects and their control] (*Missouri State Hort. Soc. Proc., 1935–36, pp. 116–147, fig. 1; 1937–38, pp. 213–215*).—Among the contributions presented in the proceedings for 1935–36 are The Codling Moth Situation, by L. Haseman (pp. 116–119), and Spray Injury, by H. G. Swartwout (pp. 125–132) (both Univ. Mo.); The Red Spider on Apples, by H. Baker (pp. 119–124) (U. S. D. A.); and Summer Oils, by C. R. Cleveland (pp. 133–147); and for 1937–38, Effects of Weather on Insect Problems, by L. Haseman (pp. 213–215) (Univ. Mo.).

Dormant season spraying: Trees and shrubs, C. C. Hamilton (*New Jersey Stas. Cir. 389 (1939), pp. 4*).—A practical discussion.

The hurricane and the newer shade tree insect problems, E. P. Felt and S. W. Bromley (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 203–205*).

Shade tree insects of the Mid-West, W. P. Flint and M. D. Farrar. (Ill. Expt. Sta. et al.). (*Natl. Shade Tree Conf. Proc., 14 (1938), pp. 94–106*).—A practical discussion.

Controlling house plant pests, C. C. Hamilton (*New Jersey Stas. Cir. 388 (1939), pp. 4*).—A brief practical account.

***Insect pests of derris*, R. C. Roark.** (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 305–309*).—A classified list of insects attacking derris, compiled by the author, is presented with 39 references to the literature cited.

Sedimentation and microprojection methods for determining particle-size distribution of insecticidal materials, L. D. Goodhue and E. L. Gooden. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 334–339, figs. 3*).—The particle-size distribution of three commercial samples of sulfur was determined by sedimentation and by microprojection. It is concluded that as far as precision is concerned "there is probably no choice between the methods, but the comparative ease with which results can be obtained by sedimentation should give this method preference for most insecticidal materials. Improvements in apparatus for both methods are described."

Dormant spray problems in New York, F. Z. Hartzell. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 274–277*).—Dormant spray problems, including materials and mixtures and the question of fall v. spring applications in regard to materials and mixtures, are considered. A summary is given of the results secured.

Insecticides to control insect pests in Jamaica, W. H. Edwards (*Jamaica Dept. Sci. and Agr. Bul. 6, n. ser. (1936), pp. [5]+50, pls. 4, figs. 11*).—A practical account of insecticides, methods of application, and the types of apparatus applicable to Jamaica conditions.

Mineral oils as insecticides, J. CARROLL (*Roy. Dublin Soc., Econ. Proc., 3 (1938), No. 5–6, pp. 63–74*).—This is a practical summary of the present status of mineral oils as insecticides.

Control of apple aphids and European red mite by coal tar oil and other materials, H. N. WORTHLEY and H. M. STEINER. (Pa. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 278–286), figs. 3*).—Experiments conducted have shown that high temperature coal-tar creosote emulsions (tar produced at 925°–1,000° C.) are effective sprays for "the control of several fruit tree and other pests, but they are caustic in nature, of questionable value against eggs of the European red mite, and appear to depress the action of lubricating oils against the eggs of this species. A low temperature coal-tar creosote emulsion (tar produced at 450°–500°) differs from the high temperature material chiefly in its higher percentage of tar acids (of high boiling range) and of paraffins and its lower percentage of aromatics. This material appears to be less caustic than the high temperature tar oils. It is as effective as the latter against aphid eggs, and in mixture with lubricating oil it seems to have less depressing effect on the toxicity of the petroleum oil to red mite eggs. It has not been tested against other insects subject to control by tar oils.

"Really adequate control of the European red mite has not been demonstrated by any of the materials reported. However, the mixtures of low temperature tar oil and lubricating oil, and of lubricating oil with added toxicants, merit further study. However, dinitro-*o*-cyclohexylphenol and sodium dinitro-*o*-cresylate appear to be only slightly toxic to eggs of the European red mite. From the standpoint both of injury and effectiveness, lubricating oil emulsified with bordeaux mixture should be tried further in the green tip and delayed dormant stages of tree development. Difficulties in the evaluation of early season sprays against the European red mite are pointed out in this paper."

Possible changes in ratio of lead to arsenious oxide in lead arsenate residues on apples, J. E. FAHEY and H. W. RUSK. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 319–322*).—Report is made of experiments conducted in southern Indiana in 1935 and 1936 to determine the extent of decomposition of lead arsenate spray residues on apples as measured by their ratios of lead to arsenious oxide. "The residues were analyzed immediately after the various cover-spray applications and again after the residues had weathered. A total of 248 samples of apples and apple foliage were used. The average ratio of lead to arsenious oxide in these samples did not vary significantly from that in the original spray material, and samples taken immediately after spraying showed no significant difference from those taken after weathering. The slight variations between the ratios are in reality the combined analytical errors of the methods of residue analysis. The high ratios obtained by early investigators are due probably to inadequate samples or to unreliable methods of analysis."

Dormant spray mixtures on conifers, F. L. GAMBRELL and F. Z. HARTZELL. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 206–209*).—The results of several years' investigations of the plant tolerance of conifers to dormant and summer sprays and the toxicity of these materials to certain insects are reported. It was shown that DN-oil (lubricating oil containing 2 or 4 percent of dinitro-*o*-cyclohexylphenol) and Elgetol at concentrations greater than 1 gal. in 100 gal. of spray mixture are likely to be attended with serious injury on evergreen conifers. There is also a possibility that 1 gal. of DN-oil or of Elgetol per 100 gal. of spray mixture "may prove injurious under certain conditions such as heavy drenching sprays, adverse weather, or low tree vigor. One- and 3-percent concentrations were used because previous experiments had

shown these amounts to be the lower and upper limits of concentration necessary for the control of certain fruit insects."

Progress report on damage done in the Kingston and St. Andrew area by termites which infest buildings, W. H. Edwards (*Jamaica Dept. Sci. and Agr. Bul. 10, n. ser. (1937), pp. 11*).—A progress report of the study of termites, the damage to buildings by which in recent years in Jamaica has increased to a marked extent.

Construction of metal termite shields, N. Turner. (Conn. [New Haven] Expt. Sta.). (*Pests, 7 (1939), No. 2, pp. 16, 17*).

Getting rid of termites in banked citrus trees, J. R. Watson (*Citrus Indus., 19 (1938), No. 12, pp. 8, 23*).

Stomach poisons and the two-striped grasshopper: Special reference to arsenic and fluorine compounds, C. H. Richardson and E. J. Seiferle. (Iowa Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 297–300, figs. 3*).—Report is made of eight chemical compounds that were tested in the laboratory as poison in bran-water-molasses baits against adults of the two-striped grasshopper. "Dosage was accomplished by an individual feeding method. The median lethal dose for arsenic trioxide was 0.026 mg. per gram of body weight; for sodium arsenite as NaH_2AsO_3, 0.015 mg. per gram and as As_2O_3, 0.0095 mg. per gram; for sodium fluosilicate 0.10 mg. per gram; and for sodium fluoride 0.04 mg. per gram, the latter being an approximation. The susceptibility of two other species of grasshoppers to these poisons is discussed. Cryolite (sodium fluoaluminate) and barium fluosilicate in bran baits were apparently rather toxic to this insect, but the data were not sufficient to determine the median lethal doses. Chloroacetamide was lethal at relatively low doses but appeared to be rather repellent. On the other hand, phenothiazine was nontoxic at doses as high as 5.8 mg. per gram. Sodium arsenite gave the shortest survival time, sodium fluoride the longest, while sodium fluosilicate and arsenic trioxide occupied an intermediate position."

The plague grasshopper Austroicetes jungi Brancsik, C. F. H. Jenkins (*Jour. Dept. Agr. West. Austral., 2. ser., 14 (1937), No. 4, pp. 367–380, figs. 6*).—This contribution deals with the species that has been responsible for the most damage in the agricultural districts of Western Australia, its morphology, biology, and control.

Further notes on the control of the harlequin bug, H. G. Walker and L. D. Anderson. (Va. Truck Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 225–228*).—In further studies (E. S. R., 69, p. 77) cage and field tests have shown that "thoroughly spraying plants infested with harlequin bugs with a mixture containing 4 lb. of derris or cube powder (rotenone content 5 or 6 percent) to 50 gal. of water, to which a good wetting agent has been added, will give good control of all harlequin bugs hit by the spray. Further, 1 part of Stantex R emulsified in 50 parts of water and thoroughly applied will give good control of this pest, as will the concentrated derris extract plus soap spray previously recommended. On large plants where the bugs are well protected it may be necessary to spray two or three times at weekly intervals to insure good control."

Studies of rice stinkbug [Solubea pugnax (F.)] populations, with special reference to local migration, W. A. Douglas. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 300–303, figs. 2*).—A report of work with the rice stinkbug *S. pugnax*, a common insect in rice fields in Louisiana, Texas, and Arkansas each year, shows that it is one of the most important insect pests of this crop.

The tarnished plant bug as an apple pest, O. H. Hammer. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 259–264, figs. 4*).—Studies

on a curious type of dimpled injury, found during the past few years on apple fruits in eastern New York fruit districts and caused by feeding punctures of the tarnished plant bug, are reported.

Food habits of Phymata pennsylvanica americana Melin (Hemip.), W. B. BALDUF. (Univ. Ill.). (*Canad. Ent., 71 (1939), No. 3, pp. 66–74*).—Observations on the insect-preying habits of *P. pennsylvanica americana* are reported in table form.

Discussion on recent advances in methods of bed-bug disinfestation, I, II (*Jour. Roy. Sanit. Inst., 58 (1938), No. 9, pp. 535–555*).—The first contribution is presented by S. A. Ashmore (pp. 535–544) and the second by B. T. J. Glover (pp. 545–555), both of whom are led to conclude that heavy coal-tar naphtha, a clear odorless liquid, is an effective remedy for the bedbug. It can be used without danger to man, and the isolation of neighboring houses and tenements is unnecessary. It is cheap, easily applied, and readily available, and has no harmful action on fittings, furniture, or furnishings.

A new **Rhagovelia** *from* **Cuba,** C. J. DRAKE *and* H. M. HARRIS (*Pan-Pacific Ent., 14 (1938), No. 4, p. 152*).

Egg parasites of the cotton flea hopper, K. P. EWING and H. J. CRAWFORD. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 303–305*).—Report is made particularly of the rearing and observation of two parasites of the eggs of the cotton flea hopper, namely, *Anaphes anomocerus*, a previously reported egg parasite of the garden flea hopper, and a new species described by Gahan as *Erythmelus psallidis* (E. S. R., 79, p. 663).

Pyrethrum and derris as a control for the six-spotted leafhopper, a vector of lettuce yellows, B. B. PEPPER and C. M. HAENSELER. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 291–296, figs. 3*).—Fencing to protect lettuce from the attack of the six-spotted leafhopper, which transmitted the virus of lettuce yellows disease, was successful in 1937 in that "only 1 percent of the protected lettuce showed symptoms of the disease, while the loss in the check plats was 31.8 percent. Small plat experiments with insecticides in 1936 and 1937 showed that a very high degree of leafhopper control was possible, while the decrease in the disease was very slight. This was thought to be due to migration of the adult leafhopper. In large plat experiments conducted in 1938 rotenone and pyrethrum dusts gave good control of the leafhopper, which in turn reduced the amount of the virus to the extent that a commercial crop of lettuce was harvested. Roguing, although not so effective as insecticides, has given approximately 50 percent reduction in lettuce yellows."

Studies on rice leaf-hoppers.—I, Biology and natural enemies, T. ESAKI and S. HASHIMOTO (*Japan Min. Agr. and Forestry, Dept. Agr., Nojikairyoshiryo No. 127 (1937), pp. [3]+135, pls. 15, figs. 9; Eng. abs., pp. 130–135*).—A summary is given of the results of an investigation of leafhoppers injurious to the rice plant in Japan. Of the 14 species representing 4 families that were observed in rice fields in the vicinity of Fukuoka, Kyushu, the jassids *Nephotettix bipunctatus cincticeps* (Uhler) and *Deltocephalus dorsalis* (Motsch.) and the delphacids *Delphacodes striatellus* (Fall.), *Sogata furcifera* (Horv.), and *Nilaparvata oryzae* (Mats.) were found to be important.

The element of timing in relation to pea aphid control, H. GLASGOW. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 234–240, figs. 2*).—Observations of the relation of aphid population to crop damage and to yield of peas, a suggested plan for timing experiments in pea aphid control studies, and timing as applied to pea aphid control are considered.

Dinitro-o-cresol, dinitro-o-cyclo-hexylphenol, and lauryl rhodanate in dormant sprays against eggs of apple aphids, W. S. HOUGH. (Va. Expt.

Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 264–270*).—Experiments reported have shown dinitro-*o*-cresol, its soluble salt sodium dinitro-*o*-cresylate, dinitro-*o*-cyclohexylphenol, and lauryl rhodanate to be effective ovicides for aphid eggs occurring on apple trees. "These compounds compared favorably with coal-tar distillate in their ovicidal action on aphid eggs. Sodium dinitro-*o*-cresylate (dinitro-*o*-cresol at 2.5 to 2.9 lb. per 100 gal.) was effective when applied in January, February, or March. Dinitro-*o*-cyclohexylphenol in oil was effective in fall and spring applications when used at concentrations of not less than 9.5 oz. per 100 gal. of diluted spray. Lighter concentrations (4.9 to 7.4 oz.) in fall applications usually gave inadequate control. Dinitro-*o*-cyclohexylphenol in water suspensions showed high toxicity to aphid eggs when applied in March. Lauryl rhodanate was toxic to aphid eggs and also to apple buds. Its phytocidal action was sufficiently severe to eliminate it from further consideration."

Control of whiteflies on gardenias, L. D. Anderson and H. G. Walker (Va. Truck Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 210–213*).—In experiments conducted, the details of which are given in tables, the citrus whitefly was satisfactorily controlled on gardenias "by thorough spraying with 1- and 2-percent solutions of Stantex R emulsified with soap, a 4-percent solution of Elgeté, and 6⅔-, 4-, and 2-percent fish oil emulsions, while Ortho Brand Garden Volk and weaker solutions of Stantex R, Elgeté, and fish oil did not give satisfactory control. Also, fish oil was a disagreeable material to handle, and it gave some foliage injury under certain conditions."

Some possible reasons for the increase of purple scale infestations, W. L. Thompson. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 12, pp. 6, 7, 17, 20*).

Advisability of treating picking boxes to prevent red scale spread, H. J. Quayle. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 24 (1939), No. 5, p. 111*).

Notes on the biology of the Great Basin tent caterpillar Malacosoma fragilis Stretch (Lep., Lasiocampidae), R. B. Swain (*Canad. Ent., 71 (1939), No. 3, pp. 76, 77*).—The tent caterpillar *M. fragilis* noted occurs in the Rocky Mountain region of the United States, where it feeds on a large variety of deciduous trees and shrubs and is the most abundant member of the genus found therein.

Sweet corn variety tests in relation to corn earworm damage at Norfolk, Virginia, H. G. Walker and L. D. Anderson (*Virginia Truck Sta. Bul. 100 (1938), pp. 1579–1593*).—Experiments commenced in 1934 to test the resistance of some of the newer varieties of sweet corn in comparison with that of a large number of other varieties that are commonly grown for roasting ear corn in Tidewater Virginia, where serious damage by the corn earworm has prevented the profitable production of sweet corn, are reported. There were wide variations in the severity of its injury to the 64 varieties of sweet and field corn grown in these tests. "In general, freedom from injury seemed to be associated with thick, close-fitting husks and with late maturity. There was some indication in tests conducted in 1937 and 1938 that corn planted to mature between July 15 and August 5 would be less seriously injured than corn planted to mature either earlier or later than these dates. The early maturing varieties tested were all so badly injured that it is doubtful if it would be practical to grow them on a commercial scale. Some of the later maturing sweet corn varieties such as Honey June, Surecropper Sugar, Money Maker, Aunt Mary, Redgreen Hybrid, Oregon Evergreen, Topcrossed Evergreen, Stowell Evergreen, and Golden Cross Bantam have produced a relatively high percentage (69 to 98 percent) of ears free from serious corn earworm damage when planted in April and May." It is pointed out that frequently corn planted after about the middle of June is

so badly injured by the corn earworm and the fall armyworm that late planting cannot be safely recommended.

This is given with a list of 13 references to the literature.

Control of sod webworms in lawns, H. H. Jewett (*Kentucky Sta. Bul. 391 (1939), pp. 89–106, figs. 4*).—A study of control measures for sod webworms, especially in lawns, commenced in the spring of 1934, is reported upon. The forms commonly found in bluegrass sod in Kentucky are the bluegrass sod webworm *Crambus teterrellus*, the striped sod webworm *C. mutabilis*, and the leather-colored sod webworm *C. trisectus*. Observations of adults at lights indicate two broods and a possible third for *C. teterrellus*, and two broods for the other two species. Work with insecticides has included the use of pyrethrum, kerosene emulsion, lead arsenate, dichloroethyl ether, barium carbonate, nicotine oleate, derris, "loro," "lethane, jr.," and poison bait. A spray containing pyrethrum was most effective for their control in bluegrass sod. "A pyrethrum extract containing 2 gm. of pyrethrins in 100 cc. should be diluted at the rate of 1 oz. to 4 gal. of water and applied at the rate of 2 gal. to 20 sq. ft. A kerosene emulsion made of ½ lb. of hard soap, 1 gal. of water, and 2 gal. of kerosene may be used with good results at a dilution of 1 part to 10 of water, applied at the rate of 2 gal. to 20 sq. ft. The emulsion must be very carefully prepared to prevent injury to the grass. Lead arsenate 2 lb. in 20 gal. of water was fairly effective when applied at the rate of 2½ lb. to 1,000 sq. ft. Soap or some other material should be added to the spray to make the lead arsenate stick to the grass." The results of some spraying experiments are given in appended tables.

Biological control of the sugarcane moth borer in Puerto Rico, K. A. Bartlett. (U. S. D. A.). (In *The Puerto Rico Sugar Manual. New Orleans, La.: A. B. Gilmore, 1938, pp. 7–9*).—Progress in the introduction of natural enemies of the sugarcane moth borer in Puerto Rico is reported.

Studies on the control of rice borers.—II, Studies on the chemical control of the rice borer (Chilo simplex Butler), I. Morino, K. Homma, T. Taniguchi, and N. Andō (*Japan Min. Agr. and Forestry, Dept. Agr., Nojikairyo-shiryo No. 115 (1936), pp. [3]+2+154+4, pls. 14, figs. 8; Eng. abs., p. 154*).—Chloropicrin used at the rate of 1.5 lb. or a little more for 1,000 cu. ft. for 2 days or longer has been found to be the most satisfactory fumigant for control of the overwintering larvae of the Asiatic rice borer in lumps of straw. The use of nicotine, although injurious to hymenopterous egg parasites, is very effective in the destruction of eggs, larvae, and moths of this pest and in preventing oviposition and the entrance of the larvae into the haulms.

Orange tortrix: A damaging pest of citrus, A. J. Basinger. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 24 (1939), No. 6, p. 201, figs. 3*).

The distribution, status, and biology of codling moth (Cydia pomonella L.) in Baluchistan, with notes on some other insects infesting apples, Hem Singh Pruthi (*Indian Jour. Agr. Sci., 8 (1938), No. 4, pp. 499–547, pls. 7, figs. 1*).—This report of a study of the distribution, status, and biology of the codling moth, details of which are appended in numerous tables, includes information on three additional forms that attack apples in Baluchistan, namely, *Spilonota ocellana* Schiff., *Euzophera punicella* Moore, and *Cacoecia arcostega* Meyr. Plates illustrating the several stages and the nature of the work of these four pests, three of which are in colors, are included.

[Efficiency of sprays for codling moth in the Northwest] (*Better Fruit, 33 (1939), No. 7, pp. 6, 14, 15*).—Reference is made to contributions on spraying for codling moth control, including costs, materials, effectiveness, and cleaning, presented by J. Marshall, F. L. Overley, and E. J. Newcomer at the annual meeting of the Washington State Horticultural Society held at Yakima.

Effect of particle size of some insecticides on their toxicity to the codling moth larva, E. H. SIEGLER and L. D. GOODHUE. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 199–203, fig. 1*).—Details of work on the effect of particle size on the toxicity of five insecticides to the codling moth larva are reported in tables. Three fractions each, graded as to particle size into "fine, medium, and coarse, of calcium arsenate, paris green, cryolite (synthetic), and phenothiazine, and two fractions of acid lead arsenate were tested in replicated series. Except for phenothiazine, no great difference in toxicity of the different fractions was obtained, but the medium fraction was generally slightly superior. In the case of lead arsenate, the coarse fraction was somewhat more effective than the fine (no medium fraction was prepared). The coarse fraction of phenothiazine was much less toxic than was the fine or the medium fraction."

Effect of copper fungicides on lead-arsenate-lime and fixed nicotine-oil sprays for codling moth, L. A. STEARNS, K. J. KADOW, and M. W. GOODWIN. (Del. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 270–273*).—Spraying experiments conducted in 1938 and other findings of the year indicate that an apple spraying program "(with, of course, certain varietal limitations), including prebloom applications of liquid lime-sulfur (or possibly a combination of liquid lime-sulfur and flotation sulfur), with flotation sulfur, lead arsenate and hydrated lime in the petal fall and first cover sprays, followed by successive applications of a relatively weak bordeaux mixture with lead arsenate is best designed to meet the exacting requirements of effective control of diseases and insects under Delaware conditions without serious spray injury on foliage and fruit."

Experiments with nicotine for the control of codling moth, B. F. DRIGGERS and W. J. O'NEILL. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 286–290*).—Tests carried on over a period of 2 yr. with a triple spray of nicotine sulfate, oil and lead arsenate, or fixed nicotine, aimed at reducing first brood of codling moth to such a low point that little or no second brood spraying will be necessary, show that "the addition of a pint of nicotine sulfate (Black Leaf 40) to 100 gal. of a spray mixture containing an ovicide and larvicide definitely improves the control. Lead arsenate proved more effective as the larvicide than fixed nicotine. Spraying from the outside of the tree using multiple nozzle rods as opposed to spraying from the ground with single nozzle guns tended to trap the adult moths in the trees, thus increasing the adult moth kill and resulting in better control. Observations indicated that the full effects of the triple spray treatments were not obtained because moths drifted in from adjoining blocks of trees."

A preliminary survey of mosquitoes in North Dakota, J. A. MUNRO and S. SAUGSTAD (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 5, p. 7*).—In a preliminary survey of the mosquitoes of the State the presence of 11 species representing 5 genera of Culicidae was determined. Two of the species, namely, *Aedes dorsalis* and *A. nigromaculis*, are known to be capable of transmitting the virus of equine encephalomyelitis from one animal to the other.

Biologies of Arkansas rice field mosquitoes, H. H. SCHWARDT (*Arkansas Sta. Bul. 377 (1939), pp. 22, figs. 5*).—The importance of mosquitoes in the rice region of Arkansas, which suffers particularly from June 1 to September 15, led to the biological study of *Psorophora columbiae*, representing 90 percent of those present, and *P. ciliata*, *P. discolor* and the common malarial mosquito, representing most of the remaining 10 percent. The observations were conducted in Arkansas County.

Mosquitoes of the Ethiopian region, I, II (*London: Brit. Mus. (Nat. Hist.), 1936, vol. 1, pp. [6]+250, figs. 158; 1938, vol. 2, pp. X+404, figs. 174*).—

The first volume of this monograph of the Culicidae of the whole of the Ethiopian region, including Africa south of the Sahara, together with Madagascar and the Mascarene Islands and southwest Arabia, by G. H. E. Hopkins, takes up the larval bionomics of mosquitoes and taxonomy of culicine larvae. The second volume, which is by A. M. Evans, reports upon Anophelini adults and early stages, with descriptions by F. W. Edwards of three new species.

Some conservation and ecological aspects of mosquito control, E. N. Cory and S. L. Crosthwait. (Univ. Md.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 213–215*).

Comparative results obtained by the use of several mosquito traps in a limited area, D. MacCreary. (Del. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 216–219, fig. 1*).—In work reported, the details of which are given in two tables, five mosquito traps were operated in various locations in a comparatively small community for 27 consecutive days during July 1937. Of the mosquitoes collected nearly 63 percent were females. Approximately 60 percent of *Aedes vexans*, which constituted nearly one-fourth of the total catch, were females. The northern house mosquito and *Culex salinarius* together comprised 65 percent of all material, and of this number 60 percent were females. It was evident, however, from the data presented that there is more flight activity among male mosquitoes than is generally believed. It was also apparent that if unusual topographical or sanitary conditions do not exist, one trap properly located would be sufficient to provide an accurate estimate of mosquito density in a community of 4,500 population.

How petroleum oil kills certain mosquito eggs, G. E. Powers and T. J. Headlee. (N. J. Expt. Stas. et al.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 219–222, figs. 2*).—Work reported, the details of which are given in tables, led to the conclusion that "eggs of *Aedes aegypti* are killed when coated with petroleum oil by oxygen starvation. The more nearly perfect the oil coating the more quickly the kill is accomplished. The variation in killing power of different petroleum oils is probably a factor of either too short a period of oil retention or a failure of the oil to make a closely applied and complete seal."

New Jersey mosquito larvicide, J. M. Ginsburg (*New Jersey Stas. Cir. 382 (1939), pp. 4*).—A practical account of the use of New Jersey Pyrethrum Mosquito Larvicide developed by the station in 1930 (E. S. R., 64, p. 160; 70, p. 509).

Experimental diking for control of sand fly and mosquito breeding in Florida salt-water marshes, J. B. Hull, W. E. Dove, and N. G. Platts. (U. S. D. A. et al.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 309–312*).

New and little known Utah Pipunculidae (Diptera), D. E. Hardy and G. F. Knowlton. (Utah Expt. Sta.). (*Canad. Ent., 71 (1939), No. 4, pp. 87–91, figs. 18*).—Notes are given on seven forms of big-eyed flies of the genus *Pipunculus*, of which three intermountain species and two varieties are described as new. The larvae of these flies frequently parasitize meadow and range leafhoppers to an important extent.

Experimental studies on the influence of low temperatures upon the development of fruit-flies.—X, Effect of varying low temperatures upon the emergence of larvae and pupae of *Chaetodacus ferrugineus* var. *dorsalis* Hendel, K. Koidsumi (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaisi), 9 (1937), No. 4, pp. 411–417*).—A continuation of the series previously noted (E. S. R., 78, p. 828).

A study of the African species of Platensinini, a tribe of the family Trypetidae (fruit-flies, Diptera), H. K. Munro (*Union So. Africa Dept. Agr. and Forestry, Ent. Mem., 2 (1937), No. 1–2, pp. 5–28+[1], figs. 5*).—A snyopsis of an important tribe of fruitflies in which four genera are erected

Studies in Australian and oriental Trypaneidae.—I, New genera of Dacinae, F. A. PERKINS (*Roy. Soc. Queensland, Proc., 48 (1936), pp. 51–60*).—The author erects six new genera and describes one new species in this contribution on the Australian species of trypanid fruitflies.

Heat sterilization of Formosan fruits for fruit-flies, I–III, K. KOIDSUMI (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaisi), 8 (1936), No. 2, pp. 157–175; 9 (1937), No. 3, pp. 275–286*).—Part 1 of these contributions, all in Japanese, reports upon preliminary determinations on the thermal death points of *Chaetodacus ferrugineus dorsalis* Hendel and *C. cucurbitae* Coq. (pp. 157–165); part 2, the results of tests of the effect of heat on "tankan" (*Citrus tankan*) (pp. 166–175); and part 3, on plum, mango, zaban (*C. maxima*), and ponkan (*C. poonensis*) (pp. 275–286).

Studies on repellents for biting flies, C. B. MACNAY (*Canad. Ent., 71 (1939), No. 2, pp. 38–44*).—The results of findings of the repellent action of various materials employed against common species of *Aedes* are reported, the details being given in table form.

***The development of immunity in cavies to the larvae of Cochliomyia americana* C. & P.,** E. W. LAAKE and C. L. SMITH. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 339–342*).—In the authors' studies, the number of screwworm larvae constituting a maximum sublethal and a minimum lethal initial infestation in the average cavy was found to be two and three, respectively, per hectogram of body weight. "The immunity or enhanced tolerance developed in cavies to *C. americana* larvae from initial maximum sublethal and from three reinfestations was determined. The amount so developed is approximately 50 to 100 percent greater than that of uninfested animals and is the result of the initial infestation. No substances deleterious to the larvae were developed by cavies from initial infestations or by as many as three reinfestations. In cavies either the extension of a local immunity or the establishing of a systemic immunity by previous infestations of screwworms was demonstrated. On the basis of a small number of animals tested, it is indicated that no enhanced tolerance to *C. americana* is inherited by cavies born of infested parents. Other than a slight retardation of death, no tolerance to *C. americana* greater than that occurring in normal cavies was produced by injections of sterile suspensions of mature tub-reared *C. americana* larvae and of *Proteus chandleri*."

Some common beetles on roses and other flowering plants, C. C. HAMILTON (*New Jersey Stas. Cir. 390 (1939), pp. 8*).—A brief practical account.

The respiratory metabolism of starved Japanese beetle larvae (Popillia japonica Newman) at different relative humidities, R. BELLUCCI (*Physiol. Zool., 12 (1939), No. 1, pp. 50–56, fig. 1*).—The observations here reported show the time of survival of the Japanese beetle larvae to depend upon the humidity. "At 0–5 percent they lived 4 days, at 56 percent they lived 12 days, and at 96 percent they lived 26 days. In these experiments death was caused by starvation at a humidity of 96 percent and by desiccation at the lower humidities. The larvae exposed to 0–5 percent humidity died with an average water content of 53.2–54.5 percent, indicating that death was caused by desiccation, and at 96 percent humidity they died of starvation, with a water content of 75.9 percent. Starvation caused the metabolic rate to fall rapidly during the first 2 days and then more slowly, fluctuating about a low level which was maintained until death. The rapid decrease in the metabolic rate to a low point, barely sustaining life, may be the factor allowing the larvae to live as long as a month at high humidities without food. There is a decrease in the respiratory quotient from an average of 0.82 to 0.70, indicating the oxidation of stored fats during starvation. Different relative humidities or the water content of

the larvae have no direct effect on the respiratory metabolism. The observed *fall in the rate of oxygen consumption is due to starvation.*"

A review of cooperative Japanese beetle retardation work in Maryland, G. S. Langford, S. L. Crosthwait, and F. B. Whittington. (Univ. Md.). (*Jour. Econ. Ent.*, 32 (1939), No. 2, pp. 255–259).

Further investigations with Japanese beetle repellents, H. G. Guy and H. F. Dietz (*Jour. Econ. Ent.*, 32 (1939), No. 2, pp. 248–252).—In continuation of earlier work (E. S. R., 77, p. 76), report is made on a new composition of tetramethylthiuram disulfide, which greatly improved the retention of the active agent. "The outstanding treatment was 5 lb. of this new tetramethylthiuram disulfide composition, which contained 20 percent inert ingredients. Two and one-half lb. of this mixture was much more effective than 4 lb. of derris. With the possible exception of zinc or aluminum sulfate and lime, all other stickers investigated reduced the efficiency of this tetramethylthiuram disulfide composition. Tetramethylthiuram disulfide was found to react with copper and should not be used in combination with bordeaux mixture, or before or after bordeaux or other copper sprays. It can be safely mixed with lead arsenate, hydrated lime, wettable sulfur, phenothiazine, or derris. Phenothiazine remains of interest and might have the added advantage of controlling codling moth in areas where this insect is a serious problem."

Japanese beetle control tests on American elm trees in Delaware, R. L. Pierpont. (Del. Expt. Sta.). (*Jour. Econ. Ent.*, 32 (1939), No. 2, pp. 253–255).—The author concludes from the work conducted that either ground derris (4 lb.) or tetramethylthiuram disulfide (5 lb.), combined with a suitable adhesive such as rosin residue emulsion, is at present the most effective protectant for the foliage of American elm trees against the ravages of the Japanese beetle. "These combinations may be used without fear of injury to, or a building up of conspicuous residue on, such trees. An application should be made prior to any heavy invasion by this insect, and the spray should be repeated as soon as any reinfestation is noted."

Control of the Japanese beetle on ornamental plants, C. C. Hamilton (*New Jersey Stas. Cir. 387* (1939), pp. 4).—A practical account.

***Schizonotus sieboldi*, an important parasite of the imported willow leaf beetle *Plagiodera versicolora*,** P. B. Dowden. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 58 (1939), No. 8, pp. 581–592, figs. 3).—Following a review of the literature, accompanied by a list of 13 references, an account is given of the distribution and host relationships, economic importance, morphology, biology and habits, and superparasitism and secondary parasitism of *S. sieboldi*, a primary parasite of *P. versicolora* and some other closely allied leaf-eating beetles (Chrysomelidae). This parasite is well distributed throughout Europe and the United States and is apparently present wherever the beetle occurs in this country. While high percentages of parasitization have been noted over a 3-yr. period in the vicinity of Boston, Mass., about the same degree of host infestation seems to have been maintained.

The immature stages of *S. sieboldi* have been described in some detail. They are very similar to those of the pteromalids *Dibrachys cavus* (Walk.) and *Habrocytus cerealellae* (Ashm.).

"The winter is spent as an adult. Two and sometimes three generations develop during the summer. The females live, mate, and oviposit well under laboratory conditions. The maximum number of eggs laid by one female was 424. The eggs are laid singly on the venter of the host pupa, and the larvae feed externally. About 15 days is required from egg deposition to adult emergence. On an average two individuals develop on one *Plagiodera* pupa. The proportion of the sexes is equal.

"Two hyperparasites, *Tetrastichus* n. sp. and *Pleurotropis tarsalis* (Ashm.), have been reared from *Schizonotus* pupae. At times *Tetrastichus* is an important enemy of *Schizonotus*."

The life-history of Nothopeus hemipterus Oliv. and its control, C. J. H. Franssen (*Landbouw* [*Buitenzorg*], *13* (*1937*), *No. 12, pp. 569–586, figs. 2, Eng. abs., pp. 585, 586*).—Report is made of a study of the biology of *N. hemipterus*, one of three related species of longicorn stemborers of the clove tree in the Dutch East Indies.

***Life cycle and food requirements of the northern grain wireworm* Ludius aeripennis destructor Brown,** E. H. Strickland (*Jour. Econ. Ent.*, *32* (*1939*), *No. 2, pp. 322–329*).—Report is made of completed life cycle studies of *L. aeripennis destructor* which have shown that in field cages in which conditions approximate "those occurring in the field, the length of the life cycle and the rate at which the individual wireworms develop is very variable. The shortest period required for the completion of the life cycle was 4 yr. and the longest, 9 yr. The rate of growth, particularly during the first 3 yr. after hatching, is very erratic. In a typical cage, 15-month-old larvae varied in length from 4.5 to 12 mm. These differences are reduced in subsequent years, and a rapid early development is of no significance with regard to the number of years required for development or to the ultimate size of the adult beetle. The number of larval instars varies from 10 to at least 24. Newly emerged larvae die from starvation in a few weeks unless they have access to suitable living vegetation. More mature wireworms can live for at least 3 yr. in soil in which no vegetation is present. It is, therefore, impractical to attempt to starve wireworms in any year except that in which they have hatched. Monocotyledonous vegetation, alone, meets the requirements of these young larvae, though a small percentage may survive on a few dicotyledonous plants. These facts have a direct bearing on the problem of reducing wireworm populations by starving newly emerged larvae in summer fallow."

Toxicity studies of so-called "inert" materials with the bean weevil (Acanthoscelides obtectus (Say)), S. F. Chiu. (Cornell Univ.). (*Jour. Econ. Ent.*, *32* (*1939*), *No. 2, pp. 240–248, figs. 4*).—Laboratory experiments, the results of which are presented in tables, have shown that certain so-called inert materials when applied as dusts are effective in killing adult bean weevils. Of six different inert materials tested, bentonite was most effective, followed in order by magnesium carbonate, crystalline silica, amorphous silica, talc, and walnut-shell flour. "There was a definite correlation between toxicity and particle sizes of the inert materials, higher insecticidal efficiency being obtained with finer particles. It was found that insects dusted with effective inert materials lost weight very rapidly, which was assumed to be due mainly to the loss of water from the body. Respiration studies indicate that the inert material did not affect the oxygen consumption of the insect. It is thought that the inert materials killed the insects by desiccation."

[Contribution on the strawberry weevil Anthonomus bisignifer Schenkling], M. Katô (*Tôhoku Imp. Univ., Sci. Rpts., 4. ser., 12* (*1938*), *No. 4, pp. 501–510, figs. 2; pp. 511–530, figs. 4*).—Two further papers (E. S. R., 78, p. 226) are presented: The Temperature Limit of Activity of the Strawberry Weevil *Anthonomus bisignifer* Schenkling (pp. 501–510), including a list of 18 references to the literature, and The Diurnal Activity of the Strawberry Weevil *Anthonomus bisignifer* Schenkling, With a Note on the Ecological Meaning of the Solar Radiant Energy (pp. 511–530).

Studies of control measures for sweetpotato weevil in Louisiana, H. L. Dozier (*Jour. Econ. Ent.*, *32* (*1939*), *No. 2, pp. 313–318, figs. 2*).

[Work in apiculture by the Wyoming Station] (*Wyoming Sta. Rpt. 1938, pp. 18–21*).—The work of the year, which again relates to wintering bees, two-queen colonies, and breeding for resistance to American foulbrood, is briefly considered in this report (E. S. R., 79, p. 83).

Recent investigations into bee-keeping at Rothamsted, D. M. T. MORLAND (*Jour. Roy. Soc. Arts, 86 (1938), No. 4451, pp. 394–402, figs. 6*).—A summary of recent work in apiculture at the Rothamsted Experimental Station.

Importance of controlled mating of queens in the development of high producing strains of honeybees, R. S. FILMER. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 223–225*).—The experiments reported indicate a decided and consistent increase in honey production in favor of the controlled mated queens and indicate the need for drone selection in the further development of our present strains of bees.

Bees and red clover, M. [H.] HAYDAK. (Minn. Expt. Sta.). (*Amer. Bee Jour., 78 (1938), No. 7, p. 313, fig. 1*).—General information on the value of bees in red clover pollination, with reference to a new variety of clover with short corolla tubes.

Pollen stores and newly emerged bees, M. H. HAYDAK. (Minn. Expt. Sta.). (*Gleanings Bee Cult., 66 (1938), No. 5, p. 297*).—This is a popular account of an experiment on the influence of a pure carbohydrate diet on newly emerged bees.

Photopsoid mutillids collected by Dr. K. A. Salman at Eagle Lake, California (Hymenoptera), C. E. MICKEL. (Minn. Expt. Sta.). (*Pan-Pacific Ent., 14 (1938), No. 4, pp. 178–185*).

The yellow-headed spruce sawfly in Maine, R. W. NASH (*Jour. Econ. Ent., 32 (1939), No. 2, pp. 330–334, fig. 1*).—The yellow-headed spruce sawfly was first noticed in Readfield, near Augusta, in early July 1934, feeding in a plantation of Norway spruce (*Picea excelsa*). It is now found well over the State and in places abundantly. It is considered under the headings of distribution, synonymy, description, life history, comparison with the European spruce sawfly, parasites, and control on ornamental spruce and in forest growth.

Spraying trials against red spider mite (Oligonychus ulmi) on damsons in Westmorland, R. A. HARPER GRAY (*Jour. Roy. Hort. Soc., 63 (1938), No. 2, pp. 77–80, pls. 2*).—In the experiments reported summer spraying gave more efficient control of the European red mite than did winter spraying. Of the winter washes a tar oil and petroleum oil emulsified gave the best results. Efficient control was obtained by a summer wash consisting of refined white oil emulsion, and others, noticeably a lime-sulfur wash, gave good control.

Ticks as vectors of animal diseases, C. B. PHILIP (*Canad. Ent., 71 (1939), No. 3, pp. 55–65*).—Information on the tick-borne diseases of animals in North America, South America, Europe, Africa, and Asia, and the ticks transmitting spirochaetes of relapsing fever is summarized, the details being given in table form.

ANIMAL PRODUCTION

[Experiments with livestock in Kentucky] (*Kentucky Sta. Rpt. 1938, pt. 1, pp. 8–13, 39, 55, 56*).—Results are briefly reported on the use of alfalfa-molasses silage for fattening steers; a comparison of distillers' corn dried grains v. cottonseed meal for fattening steers and heifers and for wintering beef cows; continuous v. rotational grazing of bluegrass pastures with ewes and lambs and with dairy heifers; lespedeza hay v. alfalfa for bred ewes; the gains secured by full feeding pigs on oat and rape, bluegrass, alfalfa, and lespedeza pastures; the relation of humidity during incubation to hatchability of turkey eggs; manganese required for normal hatching of turkey eggs and for normal growth of poults;

breeding chickens for longevity and high lifetime production; and a comparison of free-choice v. all-mash feeding of chickens.

[Livestock investigations in Wisconsin] (*Wisconsin Sta. Bul. 443 (1939), pp. 82-91, fig. 1*).—Studies for which results are reported include the value of molasses-alfalfa silage (made from good alfalfa) in the ration of milking cows, by G. Bohstedt, I. W. Rupel, and W. A. King; minerals required by pigs on soybean oil meal rations, by Bohstedt, J. M. Fargo, and King; the influence of "flushing" ewes on rate of ovulation and subsequent rate of lambing, by A. E. Darlow and L. E. Casida; the value of wheat germ oil when used as a supplement to a good poultry ration, and the interrelationships of manganese and phosphorus in the slipped tendon disease of chicks, both by J. G. Halpin, C. E. Holmes, and W. W. Cravens; the vitamin requirements of mature hens, by Halpin and Holmes; the effect of sulfur supplements in the diet on the production and hatchability of eggs, by Halpin, Holmes, and C. A. Herrick; the comparative vitamin D requirements of different breeds of chickens, by Halpin, Holmes, and E. B. Hart; the value of infertile eggs discarded by hatcheries in chick rations, by Halpin, Holmes, and M. H. Meshew; and the protein requirements of capons, and improved rations for growing poults, both by Halpin, G. E. Annin, and Holmes.

[Livestock investigations in Wyoming] (*Wyoming Sta. Rpt. 1938, pp. 11, 12, 13-15, 16, 17, 26, 27, 30, 34, 38, 39, 40, 41*).—Investigations at the main and substations, for which results are briefly reported, include the value of bonemeal as a supplement for range cattle; the effect of a low phosphorus ration and no sunshine on beef heifers; a comparison of various rations containing beet byproducts for fattening steers; the relative rate and efficiency of gain of steers and bred, open, and spayed heifers; the wool- and mutton-producing qualities of crossbred lambs resulting from mating Rambouillet ewes with Lincoln, Romney, Corriedale, and Columbia rams; shrinkage in Wyoming wool; cottonseed cake as a supplement for range lambs pastured on low-yielding corn; comparison of various maintenance and fattening rations for range lambs; comparison of alfalfa pasture v. dry lot for fattening pigs on corn and tankage; composition of certain native forage plants; a comparison of methods of feeding grain to laying hens; the effect of varying periods of artificial illumination for laying hens; the isolation of a laxative principle in rye; the inheritance of resistance to coryza; elimination of crooked breastbones in turkeys by proper adjustment of roots; a comparison of vitamin A supplements for laying hens; and the relative cost of raising pullets by different methods.

Bilateral variation in the weight and composition of the long bones of some experimental animals, C. E. Weakley, Jr., and R. B. Dustman. (W. Va. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 9, pp. 711-716*).—A study was made of the bilateral variation in the weight and composition of the green bones of 20 rats, 20 chicks, 19 hogs, and 2 dairy heifers. No significant differences were found between the right and left sides of the rat. In chicks the green weight and moisture content was slightly higher on the left side, while the percentage of ash and organic nonfat was slightly higher on the right side. This same condition prevailed in hogs, except that organic nonfat was higher in the left side than in the right. The dairy heifers showed a tendency toward heavier bones on the right side. In animals where one side tended toward a dominance in weight of bones, the same side tended to have a higher moisture content and the other side a higher ash content of bones.

Seasonal variation in the composition of bluebunch fescue, R. McCall (Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 8, pp. 603-616*).—Samples of bluebunch fescue collected at semimonthly intervals over a 4-yr period (1930-34) were analyzed. Seasonal variation in composition showed somewhat different trends during the different years, depending on prevailin

moisture and temperature conditions. Stage of maturity was the most important single factor affecting seasonal composition, particularly with reference to crude protein content, which ranged from 25.55 percent in young, growing grass to 4.56 percent in mature samples. Crude fat was highest in the new growth but variable thereafter, while ash, nitrogen-free extract, and crude fiber tended to increase as the plant approached maturity. Calcium and phosphorus contents were highest in young grass, while the rate of decline with advancing maturity was considerably faster for the latter. Both elements were so low in winter grass as to suggest the need of mineral supplement when the winter ration of animals was largely limited to the dry mature grass.

Monthly variation in carotene content of two important range grasses, Sporobolus flexuosus and Bouteloua eriopoda, W. E. WATKINS. (N. Mex. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 9, pp. 695–699, fig. 1*).—Samples of two important range grasses, mesa dropseed and black grama, collected at monthly intervals from protected enclosures on a southern New Mexico range were analyzed for carotene content. Both grasses were found to be moderately high in carotene during the growing season, reaching a peak in September. After this date, the mesa dropseed declined sharply and became entirely devoid of carotene soon after the end of the growing season. The black grama, which has a certain amount of green stem throughout the winter, contained from 4 to 11 percent as much carotene during the winter as during the early growing season. This level in midwinter seemed adequate to meet the requirements of range cattle for vitamin A.

Haying in the rain: A study of grass silage, J. G. ARCHIBALD and C. H. PARSONS (*Massachusetts Sta. Bul. 362* (*1939*), *pp. 19, pls. 4*).—The results of 3 years' study on the preparation and feeding of grass silage are reported. Any of the annual or perennial grasses or legumes or the small grains proved suitable for ensiling provided they were cut at the proper stage of maturity. A moisture content of from 60 to 75 percent at the time of ensiling is recommended, and very succulent material should be wilted in the swath until this moisture level is attained. Additions of 40, 60, and from 75 to 80 lb. of molasses per ton of green material is recommended for the grasses or small grains, grass-clover mixtures, and straight legumes, respectively. Practical suggestions for feeding grass silage are offered. Feeding trials indicated that grass silage was equal to corn silage and superior to cured hay for milk production. Milk produced on the grass silage ration was higher in vitamin A and better in flavor than milk produced on the dry hay ration. The cost per unit of dry matter was similar for the grass silage and cured hay.

Grass silage: Its place in agriculture, C. B. BENDER and E. S. SAVAGE (*New Jersey Stas. Cir. 386* (*1939*), *pp. 16, figs. 3*).—A practical discussion of the place of grass silage in the agricultural program, crops adaptable for the production of silage, various steps in the harvesting and ensiling of grass crops including kinds and amounts of preservatives to use, and ways of incorporating grass silage into the livestock feeding program.

Nutritive value and chemical composition of certain fresh-water plants of Minnesota, I–III (*Minnesota Sta. Tech. Bul. 136* (*1939*), *pp. 47, pls. 3, figs. 4*).—The results of three separate studies are reported in this publication.

I. *Nutritive value and general chemical composition of species of Elodea, Myriophyllum, Vallisneria, and other aquatic plants,* J. W. Nelson and L. S. Palmer (pp. 4–34).—Proximate analyses of the above species indicated an average ash content of 21.87, 13.83, and 15.64 percent, crude protein of 26.81, 25.83, and 15.15, and crude fiber of 15.39, 14.13, and 15.82 percent in the dry matter of *Elodea*, *Myriophyllum*, and *Vallisneria*, respectively. Mineral analyses indicated that the ash was well balanced from a nutritional standpoint,

with the possible exception of an inadequate supply of phosphorus, sodium, and chlorine. All three species were relatively rich sources of carotene and vitamins B, C, and G, but all were practically devoid of vitamins D and E. The plants differed widely in quality of protein, having coefficients of apparent digestibility of 70.28, 27.44, and 28.6, with biological values of protein of 42.71, 0, and 0, respectively. There was no evidence of any toxicity connected with these plants in rat feeding tests.

II. *The nitrogen distribution of Elodea canadensis*, A. N. Wick and W. M. Sandstrom (pp. 35–42).—This high-nitrogen species (over 4 percent nitrogen in an oven-dried sample) was further analyzed with reference to nitrogen distribution. Over one-half of the water-soluble nitrogen was isolated as a protein, while about one-third appeared in simpler compounds such as ammonia, amides, amino acids, and polypeptides. Two proteins, one water-soluble and the other alkali-soluble, were isolated. However, repeated efforts to prepare these proteins ash-free resulted in failure.

III. *The nature of the carbohydrates of species of Elodea, Myriophyllum, Ceratophyllum, Ruppia, and Ranunculus*, H. V. Lindstrom and W. M. Sandstrom (pp. 43–47).—The above five species were analyzed for certain carbohydrate constituents. In all cases these species were lower in sugar but generally higher in starch than the common cultivated hays. These aquatic species were all relatively low in crude fiber, which consisted almost wholly of cellulose. The uronic acids present largely accounted for the pentose-yielding materials in these plants.

The growth, activity, and composition of rats fed diets balanced and unbalanced with respect to protein, T. S. Hamilton. (Univ. Ill.). (*Jour. Nutr., 17 (1939), No. 6, pp. 565–582*).—The effect of varying the protein level in an otherwise complete diet from 4 to 54 percent (by substituting whole egg protein for cornstarch) was studied in a series of paired rat feeding experiments. Feeding at 10 different protein levels, it was found that as protein increased (1) metabolizable energy increased very slowly, (2) the percentage of gross energy which was metabolized was unchanged until the 30-percent level was reached, while above this level a gradual decrease occurred, (3) a gradual decrease in the ratio of energy to nitrogen in the urine occurred, and (4) no consistent effect upon digestibility of either food energy or food nitrogen could be noted. Optimum growth occurred when the protein level ranged from 16 to 30 percent. Total gain in weight was not as good a criterion of growth as gain in protein and gain in body length. The composition of gains was markedly affected by the extremes of protein feeding, but little affected within the range of 16 to 42 percent.

The heat increments of diets balanced and unbalanced with respect to protein, T. S. Hamilton. (Univ. Ill.). (*Jour. Nutr., 17 (1939), No. 6, pp. 583–599*).—Further data from the above trials indicated that the heat increment of the diet decreased coincident with increases in percentage of protein up to about the 18-percent level, remained constant within a range of 18 to 30 percent, and then increased again as the protein increased to 42 percent or above. A close inverse relationship was found to exist between the heat increments and the growth-promoting abilities of the rations, with maximum net energy values for growth and maintenance occurring within the 16 to 30 percent protein range. The percentage of net energy used for basal expenditures or for voluntary activity was unaffected by the protein level.

The heat production and blood and urine constituents after administration of d-lysine monohydrochloride to the dog, J. R. Doty and A. G. Eaton. (La. State Univ.). (*Jour. Nutr., 17 (1939), No. 5, pp. 497–504*).—Dogs

thoroughly trained for metabolic experiments and with established basal metabolic rates received injections of glycine (check) or lysine. Blood and urine analyses indicated that lysine is metabolized much more slowly than glycine and is readily excreted by the kidneys if present in the blood in large quantities. Lysine did not produce a specific dynamic action, as indicated by the heat production after its injection.

The heat production and blood and urine constituents after administration of d-arginine monohydrochloride to the dog, A. G. EATON and J. R. DOTY. (La. State Univ.). (*Jour. Nutr., 17 (1939), No. 5, pp. 505-511*).—In experiments similar to the above, arginine was administered to dogs either intravenously or orally. Following either type of administration a prompt and sustained rise in the urea nitrogen of the blood was noted, and in the intravenous injection a considerable proportion was excreted in the urine as unchanged arginine. Arginine was metabolized somewhat more slowly than glycine, and on the basis of Calories per unit deaminized it had a slightly higher dynamic action than glycine.

Vitamins in the nutrition of animals, W. C. RUSSELL. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 2, pp. 81-89*).—A summary.

The influence of exercise on the growing rat in the presence and absence of vitamin A, N. B. GUERRANT, R. A. DUTCHER, and F. CHORNOCK. (Pa. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 5, pp. 473-484, figs. 5*).—Three groups of young rats on a vitamin A-deficient basal diet until depleted and then given vitamin A supplement and comparable groups constantly fed a vitamin A-adequate diet were subjected to forced exercise, voluntary exercise, and to confinement in the usual type of cage, respectively. Under comparable conditions of feeding less food was consumed, less gain in weight was made, and less severe symptoms of vitamin A deficiency developed when animals were forced to exercise than under voluntary exercise or confinement. Forced exercise resulted in the greatest efficiency of food utilization but also in the voiding of the greatest number of fecal pellets. Under voluntary exercise conditions, animals receiving adequate vitamin A were more active physically than those on the vitamin-A deficient diet.

Vitamin E and nutritional muscular dystrophy, C. G. MACKENZIE and E. V. MCCOLLUM (*Science, 89 (1939), No. 2312, pp. 370, 371*).—Preliminary findings gave evidence that the type of muscular dystrophy which develops in rabbits confined to the Goettsch and Pappenheimer basal diet No. 13 (E. S. R., 66, p. 796) can be promptly cured by the administration of small doses of vitamin E concentrate or by the administration of natural alpha tocopherol.

The vitamin G content of some oil press-cake meals and related products, F. W. SHERWOOD and J. O. HALVERSON. (N. C. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 10, pp. 787-794, fig. 1*).—Employing the rat-growth method of assay and considering vitamin G as the undifferentiated complex which stimulates growth when the basal ration is supplied with an extract of rice polish but otherwise free of water-soluble vitamins, the vitamin G content of 4 samples of peanut meal, 6 of cottonseed meal, 1 of cottonseed flour, 1 of cottonseed hull bran, 3 of linseed meal, 5 of soybean meal, and 1 of soybeans was found to range between 2.5 and 5.9 Sherman-Bourquin units per gram (E. S. R., 79, p. 669).

Determination of slaughter-steer grades from weights and measurements, B. KNAPP, JR. (*U. S. Dept. Agr. Cir. 524 (1939), pp. 8, figs. 4*).—Based on the data secured on 167 steers of Hereford, Shorthorn, Aberdeen Angus, and dairy breeding, the following formula was derived which expresses the multiple curvilinear relationship between height at withers, weight or heart girth,

and slaughter grade: $\text{Grade} = -223.2839 - 3.5853\ (H) + 157.9825\ (\log W)$, in which grade is the slaughter grade in percent, (H) is the height at withers in inches, and $(\log W)$ is the log of live weight in pounds. The greatest deviation between the grade assigned by trained graders and the predicted grade by this formula was one-half of a grade. A table is presented showing slaughter-grade classification on the basis of height at withers and heart girth which may be used when scales are not available.

Hybrid baby beef production, F. C. Daugherty (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 5, p. 10*).—A brief progress report on the birth weight and rate of gain of calves resulting from reciprocal crosses of Aberdeen Angus and Shorthorn cattle as compared with purebred calves of each breed.

Relationship between carotene, blindness due to constriction of the optic nerve, papillary edema, and nyctalopia in calves, L. A. Moore. (Mich. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 5, pp. 443–459, figs. 7*).—Following a previous report (E. S. R., 73, p. 672), conclusive evidence has been secured to indicate that calves fed low carotene rations developed night blindness, papillary edema, and a permanent type of blindness associated with a constriction of the optic nerve. The development of these conditions was prevented by supplementing the low carotene ration with crystalline carotene dissolved in cottonseed oil, indicating that these conditions are a part of the syndrome of vitamin A deficiency in calves. Other conditions associated with these abnormalities are described. Vitamin A deficiency in calves may be diagnosed by the presence of both papillary edema and night blindness, and, under proper conditions of observation, by bleaching of the tapetum lucidum of the retina. Plasma carotene determinations of the bovine also give an indication of the vitamin A reserve under conditions of low carotene intake.

Improving beef cattle pastures on rice lands, C. I. Bray (*Louisiana Sta. Bul. 305 (1939), pp. 14, figs. 4*).—Grazing trials with beef cattle during three seasons gave evidence that on rice fallow land, where rice alternated with pastures every other year, the grazing was profitably increased by seeding with white clover, lespedeza, or Italian ryegrass. Seeding directly on the rice stubble with little or no seedbed preparation is considered most practical. The merits of more permanent pasture to be grazed 2 yr. or more is discussed, and suggestions for establishing such pastures are offered.

Reducing the corn and increasing the hay content of rations for fattening yearling steers.—Summary of three years, P. Gerlaugh and C. W. Gay (*Ohio Sta. Bimo. Bul. 198 (1939), pp. 57–60*).—A summary of the results of three trials showed an average daily gain per steer of 1.91, 1.78, and 1.69 lb. for groups of steers receiving a full grain ration, three-fourths full feed, and one-half full feed, respectively. The average selling price of cattle in the second group was only slightly lower than for the full-fed cattle, whereas those in the third group sold for about 80 ct. per hundredweight less than the full-fed steers. On the basis of average yields of corn and hay the ratio of acres of corn (grain and silage) to acres of hay consumed under the three plans were 5.5:1, 2.3:1, and 1.2:1, respectively. The second plan is considered a sound farm practice under average conditions, while the third plan is not recommended unless hay is very low in price.

Reducing the amount of corn and increasing the amount of legume hay in rations for fattening yearling steers, III, P. Gerlaugh and C. W. Gay (*Ohio Sta. Bimo. Bul. 198 (1939), pp. 55, 56*).—The third trial in this series (E. S. R., 79, p. 670) was conducted under the same general plan as earlier trials. The results tended to substantiate the previous findings.

Fattening steer calves—varying the amounts of supplement and molasses, P. Gerlaugh (*Ohio Sta. Bimo. Bul. 198 (1939), pp. 53–55*).—Following ear

ther studies to determine the optimum level of protein supplement in steer fattening rations (E. S. R., 79, p. 670), five lots of steers receiving a basal ration of shelled corn, silage, and mixed hay were given varying amounts of mixed protein supplement with and without additions of molasses. The addition of 1 lb. of molasses per steer daily to the check ration (1.5 lb. protein supplement per steer daily) increased the rate of gain of steers and the final degree of finish and appeared to be justified at prevailing feed prices. Further increase in either the amount of molasses or of protein supplement increased the feed cost more than the increased rate of gain would justify.

Returns per acre in cattle feeding: Medium and late varieties of corn for silage; silage versus limited amounts of corn-and-cob meal, P. GERLAUGH and H. W. ROGERS (*Ohio Sta. Bimo. Bul. 198 (1939), pp. 60, 61*).—This trial was designed to determine the returns per acre of corn in terms of beef when each of two varieties of corn was fed as silage and one of the varieties was fed as corn-and-cob meal plus stover. A mixed protein concentrate and legume hay supplemented the corn products in each instance. The average daily gain of steers was practically identical for the three groups of cattle. The dry-fed cattle showed slightly better finish at the conclusion of the test, but the pounds of gain per acre of corn and hay were favorable to the silage-fed lots.

Oat hay poisoning, W. B. BRADLEY, O. A. BEATH, and H. F. EPPSON. (Univ. Wyo.). (*Science, 89 (1939), No. 2312, p. 365*).—Confirmatory evidence was secured to indicate that oat hay produced in certain areas of Wyoming exerted a strongly toxic effect on cattle. Eleven lb. of this toxic hay caused the death of a 350-lb. steer 9 hr. after feeding, while the water extract of 11 lb. of the hay caused typical symptoms in another steer of similar size. In each instance a high methemoglobin content of the red blood cells was observed. Preliminary investigations indicate that the toxicant is formed during the development of the oat plant. The localization of the problem suggests the basic significance of local influences.

A ranch observation on feeding sheaf oats to lambing ewes, L. R. VAWTER. (Nev. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 2, pp. 128, 129*).—In the incident reported, a flock of pregnant ewes was confined in pens and subsisted entirely on a diet of sheaf oats from late December to March. About 15 percent of the ewes died soon after lambing with a symptom complex suggesting pregnancy disease or vitamin A and calcium deficiency. The losses stopped abruptly when the flock was removed to a larger, clean pen and fed good alfalfa hay in addition to the sheaf oats, suggesting that the oat plant was inadequate when fed as a sole diet to the ewe breeding flock.

The relation between the down hair and curl on the Karakul lamb and the mature Karakul sheep [trans. title], L. ADAMETZ (*Ztschr. Tierzücht. u. Züchtungsbiol., 41 (1938), No. 1, pp. 90–106*).—A study of 10 Karakul fleece and lamb skins grading from good to prime led to the belief that the amount and tightness of curl depended on several properties in addition to fineness of down and prevalence of guard hairs.

The role of riboflavin and other factors of the vitamin-B complex in the nutrition of the pig, E. H. HUGHES. (Univ. Calif.). (*Jour. Nutr., 17 (1939), No. 6, pp. 527–533, figs. 2*).—Continuing this line of investigation (E. S. R., 80, p. 670), additional evidence was secured to indicate that riboflavin, thiamin, and one or both dietary factors present in rice bran filtrate are essential for the proper nutrition of the pig.

The value of fortified cod liver oil in the production of market hogs, W. C. SKELLEY (*New Jersey Stas. Bul. 661 (1939), pp. 15, figs. 2*).—In a trial

all lots were kept indoors without exposure to sunshine and fed a ration of corn meal, tankage, and minerals. One-half of the lots received a supplement to the basal ration of 0.25 percent of fortified cod-liver oil. Over an experimental period of 128 days the average daily gains per pig were 1.019 and 1.219 lb., and the feed required per 100 lb. of gain 456.7 and 364.8 lb. for the control and supplemented groups, respectively. Three lots carried for 165 days showed similar trends in rate and efficiency of gain. Slaughter tests failed to show any marked differences in dressing percentages of the various groups, and there was no evidence of off-flavor or odor in the carcasses as a result of feeding the fortified cod-liver oil. Pigs in the supplemented groups showed a slightly higher percentage of bone ash, but there was no significant difference in levels of calcium and phosphorus in the blood of pigs in the various groups. However, two pigs from the control groups which died after 87 and 126 days on experiment showed typical rachitic symptoms.

Spelt equals oats for pigs, V. A. Freeman (*Michigan Sta. Quart. Bul., 21 (1939), No. 4, pp. 279, 280*).—A single feeding trial in which spelt and oats were each fed in combination with corn and a protein supplement to fattening pigs indicated that these two grains were of very similar feeding value.

A study of bacteria contaminating sides for Wiltshire bacon, with special consideration of their behaviour in concentrated salt solutions, E. H. Garrard and A. G. Lochhead (*Canad. Jour. Res., 17 (1939), No. 2, Sect. D, pp. 45–58, figs. 3*).—Forty microbial types (micrococci predominating) were isolated from sides of bacon prior to curing and considered representative of precuring contamination. These have been classified into five groups, depending on their ability to survive in salt solution and curing pickle. The organisms displayed much greater resistance to salt in curing pickle than in brine of similar sodium chloride content, indicating that the pickle exerted a protective action against the toxic effect of salt. Many types survived the pickling, leading to the suggestion that those types may later become active and contribute to storage defects. Nitrate reduction in curing pickle appeared to be a function of true halophiles rather than to any of the precuring contaminants.

Principles of poultry breeding, F. B. Hutt. (Cornell Univ.). (*U. S. Egg and Poultry Mag., 45 (1939), No. 6, pp. 364, 365*).—A brief résumé.

Nutritional gizzard lesions in chicks, W. B. Esselen, Jr. (*Massachusetts Sta. Bul. 355 (1939), pp. 73, 74, pl. 1*).—A progress report.

Distribution of phosphorus in the leg bones of chickens, M. J. L. Dols, B. C. P. Jansen, G. J. Sizoo, and G. J. van der Maas (*Nature [London], 142 (1938), No. 3604, pp. 953, 954, fig. 1*).—Solutions of radioactive phosphorus were intraperitoneally injected into both rachitic and normal chicks, and the distribution of phosphorus in the leg bones was studied 22 hr. after injection. As expected, the phosphorus content of the dry matter in all parts of the bones of normal chicks was higher than in rachitic chicks. In both lots the total phosphorus content of the diaphysial part of the bone was higher than for the epiphysial part of the same bone. A greater concentration of the radioactive phosphorus was found in the bones of rachitic chicks than in normal ones, also a greater concentration in the epiphysial part than the diaphysial part of the same bone, thus indicating that phosphorus metabolism is more intense in the bones of rachitic chicks than in the bones of normal ones and also more intense in the epiphysial part than in the diaphysial part of the same bone.

The need for manganese in the bone development of the chick, C. D. Caskey, W. D. Gallup, and L. C. Norris. (Cornell Univ.). (*Jour. Nutr., 17 (1939), No. 5, pp. 407–417, fig. 1*).—This is a more detailed report of the research previously noted (E. S. R., 79, p. 235).

Some observations on methods of fattening chickens, A. J. G. and W. A. Maw (*U. S. Egg and Poultry Mag., 45 (1939), No. 6, pp. 332–334, 378, figs. 2*).—The results of two trials at Macdonald College comparing the rate and efficiency of gain of Rhode Island Red cockerels over fattening periods of 7, 10, 14, and 21 days when fed two, three, and five times per day are presented. Two feeds per day gave definitely smaller average gains than three or five feeds and also the groups getting the larger number of feeds per day showed a slight advantage in gain per unit of feed consumed. There was a high variability in amount of daily gain by individuals which is at least partially attributed to various uncontrolled environmental factors.

Canadian studies on electrical methods of killing poultry, D. C. Rose (*U. S. Egg and Poultry Mag., 45 (1939), No. 5, pp. 270–275, figs. 7*).—The results of preliminary studies at the Canadian National Research Laboratories on the applicability of electrical methods for killing poultry are reported. The electrical circuits and types of electrodes used in these studies are illustrated. By proper regulation of voltage and resistance in the circuit and proper application of the electrodes good feather release could be obtained, and the bleeding after electrical stunning was satisfactory.

The feed cost of producing eggs in New Jersey in 1938, L. M. Black (*New Jersey Stas. Hints to Poultrymen, 26 (1938), No. 1, pp. 4*).—A summary of 14 individual flock records showed an average annual egg production of 181.2 and 136 eggs per pullet and per hen, respectively, an average total feed consumption of 95.3 lb. per bird, and an average return above feed costs of $2.13 per bird, based on the average number of birds for the year. The percentage decrease in number of birds during the year was 48.8 and 45.7 for pullets and hens, respectively.

Millet feeding for turkeys, G. P. Goodearl (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 5, pp. 3–6*).—Three years' experiments in which proso millet replaced one-half or all of the yellow corn in standard starting and growing rations for turkeys gave evidence that the millet rations were readily consumed by young, growing turkeys. The millet-fed groups consistently weighed more at marketing time than the corn-fed group, while on the average slightly more millet rations were consumed per pound of gain. There was little difference in the rate of mortality in the various groups.

Relative influence of the various factors that affect egg production of turkeys during different parts of the first laying year, V. S. Asmundson. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 10, pp. 747–754*).—In further analyzing the data previously described (E. S. R., 79, p. 381), the first laying-year records of turkey hens were arbitrarily divided into three periods: (1) From first egg to end of April, (2) May and June, and (3) after June. Egg production in each period was correlated with various factors. Egg production during the first period was influenced most by sexual maturity (date of first egg) and to a lesser extent in order by length of pauses, date of last egg, and net rate. Egg production in May and June was influenced most by length of pauses and date of last egg, while persistency was by far the greatest influence after June. Factors of greatest importance in selecting for improved egg production during the breeding season are, in order of importance, sexual maturity, length and number of all broody and nonbroody pauses, and net spring rate.

Finishing rations for turkeys, E. I. Robertson, J. S. Carver, and J. W. Cook (*Washington Sta. Bul. 372 (1939), pp. 20, fig. 1*).—In the experiments described, six pens of poults were raised to 20 weeks of age on the same starting and developing rations, the one variation in treatment consisting of different methods of feeding grain. At 20 weeks of age there were only slight differences

in the weight of groups receiving only the pelleted mash ration, those receiving pellets plus grain (hand-fed), and those receiving pellets plus grain (hopper-fed). The poults were redistributed into six groups at 20 weeks and fed over an 8-week experimental period to compare three finishing rations and two grain mixtures. Approximately 48 percent of the total feed was consumed during this 2-mo. period. There was little difference between the weight of hens or toms in the various groups, the toms averaging 25.9 lb. and the hens 15.9 lb. at 28 weeks. All of the rations gave good results in growth, feathering, and fleshing, and the average returns per turkey over feed costs were very similar, ranging from $2.19 to $2.35. The hens showed approximately 2 weeks' earlier feathering and fleshing than the toms. The shrinkage between live weight before killing and dressed weight was 9 percent after a 24-hr. starvation period on wire floors.

The proper handling of hatching eggs and the incubator on the farm, V. DARAGO (*New Jersey Stas. Hints to Poultrymen, 26 (1939), No. 2, pp. 4*).—Practical suggestions are offered.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle and dairy products in Massachusetts] (*Massachusetts Sta. Bul. 355 (1939), pp. 22–24, 38, 45–51*).—Progress reports (E. S. R., 79, p. 529) are presented for the following lines of investigation by J. G. Archibald, C. H. Parsons, W. S. Ritchie, and W. Esselen, Jr.: The effect of vitamin A concentrates on growth and reproduction in dairy cattle; the effect of complex mineral and vitamin mixtures on general health, reproduction, and milk production in dairy cattle; the influence of supplemental phosphorus in the ration on the phosphorus content of milk; the influence of artificial light on milk production; the composition and vitamin content of certain pasture grasses; the production and use of legume and grass silages; and the value of dried citrus pulp for dairy cattle.

Reports of studies with dairy products by W. S. Mueller, M. J. Mack, L. D. Lipman, R. L. France, H. G. Lindquist, J. H. Frandsen, and M. Glickstein include methods of improving flavor and keeping properties of milk and certain milk products; the effect of chocolate-flavored sirups on certain properties of chocolate milk; factors to be considered in selecting chocolate-flavored milk; the nutritive value of chocolate-flavored sirup containing yeast; the digestibility of chocolate-flavored milk in vitro; bacteriological properties of chocolate-flavored sirups and cocoas; the effect of aging treatments on gelatin and other ice cream stabilizers; factors affecting the properties of whipped cream; changes occurring in the storage of frozen sweet cream; egg solids as a constituent of ice creams; factors affecting the melting appearance of ice cream; sodium alginate as a stabilizer for ice cream; the stability of the fat emulsion of cream; the development of new dairy products utilizing milk, cream, cheese, and plastic cream; the utilization of whey byproducts; and the efficiency of a multiple-purpose separator.

[Experiments with dairy cattle in Wyoming] (*Wyoming Sta. Rpt. 1938, pp. 12, 13, 28, 29*).—Brief results are reported for the following investigations: The effect of maintaining heavy milking cows for long periods on a ration consisting solely of alfalfa hay and pasture; the economy of limited grain feeding v. sole roughage feeding for milking cows; open-shed v. stable milking; and roughage rations for dairy heifers.

Studies on the composition of bovine blood as influenced by gestation, lactation, and age, W. L. KENNEDY, A. K. ANDERSON, S. I. BECHDEL, and J. F. SHIGLEY. (Pa. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 4, pp. 251–260,*

figs. 3).—Analyses of blood samples collected at weekly intervals from dairy heifers throughout the period of gestation and 1 yr. of lactation showed comparatively little variation in the levels of nonprotein nitrogen, glucose, calcium, and phosphorus over this period. Average values obtained for nonprotein nitrogen were 32.82, for glucose 52.12, for calcium 10.91, and for phosphorus 5.44 mg. per 100 cc. of blood. Blood sugar studies on calves from birth to approximately 2 yr. of age indicated a marked effect of age on blood glucose levels, average values ranging from 125 mg. per 100 cc. of blood for calves under 1 week of age to 54.4 mg. at the end of the year. Carbohydrate tolerance tests on animals at different ages showed a marked response to sugar feeding in young calves, but very little response in the older groups.

The chemical composition of the blood of the dairy goat, O. B. HOUCHIN, W. R. GRAHAM, JR., V. E. PETERSON, and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 4, pp. 241–250*).—Data on the average values for the more important constituents of arterial and venous blood of dry and lactating goats, obtained during the course of previously reported experiments (E. S. R., 78, p. 689; 80, p. 534), are presented as tentative normal standards for this species, along with comparative data for other species. No significant differences in the composition of the goat plasma in comparison with other mammals were apparent. Cell volume for the goat appeared unusually low, probably due to the small size of the red blood corpuscles. Sixty-three references are cited.

A study of factors concerning herd management and herd production, L. COPELAND (*Jour. Dairy Sci., 22 (1939), No. 4, pp. 229–239, fig. 1*).—A detailed analysis of the production records of 1,046 Jersey herds which had completed at least 1 yr. of official Herd Improvement Registry testing led to the following general conclusions: The percentage of dry cows in the herd during the year is one of the main factors affecting the herd production average, the average of all herds containing about 15 percent of dry cattle. Breeding efficiency, which largely determined the percentage of dry cows, is inversely related to the size of the herd. Culling is an advantageous practice, regardless of the herd average. Herd Improvement lactation records of from 10 to 12 months' duration averaged from 10 to 12 percent lower than comparable Register of Merit records. Jersey heifers freshened at an average age of 2 yr. 2.5 mo., while the average age of all producing cows was 5 yr. 2 mo. Persistency of lactation tended to decline slightly with advancing age. Three- and 4-year-old cows predominated in replacements, while over 54 percent of all cows removed from herds were under 5 yr. of age. First-calf heifers freshening during the year did not handicap the herd average.

Skim milk powder for calves and a comparison of various supplemental feeds, A. C. MCCANDLISH (*West of Scot. Agr. Col., Res. Bul. 7 (1939), pp. 64*).—A summary of the available literature with 277 references is presented, together with the results of 12 experimental feeding trials involving a total of 74 calves. An average gain of 1.65 lb. per calf daily was obtained in a check group of calves receiving whole milk, grain, and hay to 90 days of age. Four grain mixtures each in combination with reconstituted skim milk were compared among the other lots. Relatively good gains were secured in all cases, although the bloom on the skim milk-fed calves was not as good as with the whole-milk group. No reactions to the tuberculin test occurred among the skim milk powder-fed groups. Where skim milk powder was fed with hay and a suitable grain mixture the question of protein quality did not arise.

Magnesium and vitamin D relationships in calves fed mineralized milk, C. E. KNOOP, W. E. KRAUSS, and C. C. HAYDEN. (Ohio Expt. Sta.). (*Jour.*

Dairy Sci., 22 (1939), No. 4, pp. 283–289, fig. 1).—Three groups of Holstein calves receiving a ration of (1) a basal diet of whole milk plus iron and copper, (2) basal plus magnesium carbonate, and (3) basal plus magnesium carbonate plus ultraviolet irradiation from birth to 255 days of age were compared with reference to rate of growth, blood picture, and quality of bones. The rate of gain was quite regular and similar for all groups to 140 days of age, while beyond this age the rate of gain decreased and became quite irregular in all cases. Blood studies indicated fairly constant and normal blood calcium values for all calves, although certain calves in both lots 1 and 2 had values sufficiently low to suggest low calcium rickets. The blood phosphorus values tended to decrease slightly in all cases as the experiment advanced. Blood magnesium values decreased steadily in the control group, reaching a level below 2 mg. when the calves were 120 days of age, while normal values were consistently maintained in lots 2 and 3. Bone magnesium values were quite similar in groups 2 and 3, both averaging consistently higher than group 1. Calves receiving ultraviolet irradiation had heavier bones than the other groups, but otherwise little difference was noted between the three groups.

The influence of different levels of fat in the ration upon milk and fat secretion, G. GIBSON and C. F. HUFFMAN (*Michigan Sta. Quart. Bul., 21 (1939), No. 4, pp. 258–264, figs. 2*).—Two groups of milking cows were fed rations of varying fat contents over 24-day experimental periods. The basal low-fat ration was composed of alfalfa, molasses, dried beet pulp, solvent-extracted soybean oil meal, and bonemeal. The addition of soybean oil in place of an isodynamic amount of beet pulp to this basal ration resulted in an increase in milk production and caused a temporary sharp increase in percentage of butterfat in the milk. However, within a short time (4–12 days) the fat percentage returned to normal. Replacing beet pulp by corn in the basal ration resulted in an increase in milk production, while the fat content of the milk remained unchanged. When a high-fat ration (basal plus soybean oil) was replaced by one low in fat, there was a drop in milk production but an increase in the percentage of fat in the milk. Thus it appeared that the basal ration was the important factor in determining the effect of the addition of fat to the ration on milk and fat secretion.

Composition and properties of goat's milk as compared with cow's milk, J. A. GAMBLE, N. R. ELLIS, and A. K. BESLEY (*U. S. Dept. Agr., Tech. Bul. 671 (1939), pp. 72, figs. 11*).—The results of a detailed study carried on from 1929 to 1932 and comparing the milk of 20 to 25 Saanen and Toggenburg does with Holstein and Jersey cow's milk are reported. The goat's milk on the average was similar to Holstein milk in percentages of water, protein, fat, and lactose, although subject to greater variation with advance of lactation than either of the cow's milk. It contained a high ratio of albumin and globulin to casein and considerably higher quantities of the fatty acids, caproic, caprylic, and capric, than did either of the cow's milk. The fat globules of Holstein milk averaged 1.97 times and Jersey milk 5.53 times as large as those of goat's milk, while the curd of the latter was 31 and 54 percent softer than that of Holstein and Jersey milk, respectively. There was no significant difference in surface tension measurements of the three milks. The buffer capacities of goat's milk and Jersey milk were similar over a pH range of 5.2 to 6.4, both exceeding Holstein milk in this respect. The vitamin content of the milks as determined by tests with rats and guinea pigs showed goat's milk to be similar to Holstein milk in vitamin A content, relatively high in vitamins B and G potency, and entirely lacking in vitamin E. The milks were all similar in vitamin D potency, while all were inadequate sources of vitamin C in the levels consumed. All three milks were low in iron, and nutritional anemia developed on any of the unsupplemented milk

ucts. *Aseptically drawn goat's milk was generally very low in bacteria, over 80 percent of the samples showing no evidence of bacterial growth.* Controlled feeding tests with rats, goat kids, and healthy babies failed *to show any signifi*cant differences in growth-promoting properties of any of the milks, gains occurring in each instance in proportion to the total nutrients consumed in the milk. A bibliography of 136 references is appended.

Effect of heat on milk, with especial reference to the cooked flavor, I. A. GOULD, JR., and H. H. SOMMER (*Michigan Sta. Tech. Bul. 164 (1939), pp. 48, figs. 6*).—The major objectives of this study were to determine the temperature at which cooked flavor may be produced in whole milk, cream, and skim milk; the influence of various factors upon the temperature at which cooked flavors are produced; the relation between the temperature causing cooked flavor and that which prevents oxidized flavor development; and the relationship between cooked flavor and the liberation of sulfides from milk. The appearance of cooked flavor proved to be a function of time as well as temperature, such flavors occurring when milk was heated to 76°–78° C. momentarily, 74°–76° for 3 min., or 70°–72° for 30 min. Increasing the pH of milk and increasing the butterfat content each caused a lowering of the cooked flavor temperature, while skim milk required 2°–4° higher temperature to produce this flavor defect than whole milk. Aeration of the milk during heating, dilution with water, separation and remixing, and mastitis infection, all had little influence on cooked flavor. Temperature and breed differences in this respect were slight. The oxidation-reduction potential of milk, skim milk, or cream showed no change until the temperature was sufficiently high to produce cooked flavor, but above this point the Eh became progressively more negative with increase in temperatures. The cooked flavor was found closely related to heat prevention of oxidized flavor if copper contamination occurred before heating, but no relation was observed when copper was added after heating. The cooked flavor is attributed to the formation of sulfides which occur when milk is subjected to sufficiently high temperatures or to other changes occurring simultaneously with this formation.

The effect of churning on the vitamin A and carotene content of milk fat, K. M. HENRY, S. K. KON, A. E. GILLAM, and P. WHITE (*Jour. Dairy Res. [London], 10 (1939), No. 1, pp. 114–117*).—A comparison of vitamin A and the carotene content of 14 samples of churned butterfat with comparable ether-extracted fat samples from the same milks indicated that a significant amount of carotene was lost in churning, while the vitamin A content was not appreciably affected.

Ascorbic acid and oxidized flavor in milk.—I, Distribution of ascorbic acid and occurrence of oxidized flavor in commercial grade A raw, in pasteurized irradiated, and in pasteurized milk throughout the year, G. M. TROUT and E. C. GJESSING. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 4, pp. 271–281, figs. 3*).—Samples of commercial grade A raw, irradiated pasteurized, and regular pasteurized milks collected at frequent intervals throughout the year were titrated for 4 consecutive days for ascorbic acid content and on the third day of titration were examined for development of oxidized flavor. The average first-day ascorbic acid values in raw milk were 6, 10.5, 8.8, and 7.7 mg. per liter; those for irradiated pasteurized 7.2, 11.1, 14.2, and 10.9; and those for regular pasteurized 9.9, 12.9, 13, and 13 mg. per liter for winter, spring, summer, and fall samples, respectively. The rate of disappearance of ascorbic acid calculated on the third day of titration was greater in winter than in summer and was relatively greater in the raw and irradiated pasteurized than in regular pasteurized samples. Conversely, the stability of ascorbic acid against oxidation was greater in summer than in winter milk. The irradiated milk consistently developed a strong oxidized

flavor from late fall to early spring, raw milk developed a less pronounced though troublesome flavor during the same period, while no oxidized flavor was detected in pasteurized milk throughout the year. None of the above milks were exposed to copper during processing. The direct titration method of determining ascorbic acid was found to be very useful in predicting the presence of catalysts in commercial bottled milk.

Studies in mastitis, I–VI (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 1*, *pp. 59–107*, *figs. 2*).—Six phases of this comprehensive study at the National Institute for Research in Dairying are reported.

I. *The routine diagnosis of mastitis*, J. G. Davis, J. McClemont, and H. J. Rogers (pp. 60-73).—This report describes the cultural characteristics of mastitis and other streptococci found in milk and indicates technics and media for the routine diagnosis of mastitis.

II. *A comparison of methods for the detection of subclinical mastitis*, J. G. Davis and J. McClemont (pp. 74-80).—Using the results obtained by plating milk twice on Edward's medium as a criterion, 12 methods for the detection of subclinical mastitis have been compared. The correlation between various single tests and also between certain combinations of tests and the standard criterion are indicated. Simple tests such as bromocresol purple paper, the strip cup, and induration are of value in indicating the incidence of mastitis in a herd, but only carefully controlled bacteriological examination in the laboratory can give a true diagnosis.

III. *Mastitis in relation to "udder counts,"* J. McClemont and J. G. Davis (pp. 81-87).—A correlation between udder counts (in milk agar) and true diagnosis for mastitis is indicated. Counts under 100 per cubic centimeter are considered as indicating freedom from infection, while counts of over 500 are considered suggestive and those over 1,000 indicative of mastitis.

IV. *Mastitis in relation to the methylene blue reduction test*, J. McClemont and J. G. Davis (pp. 88-93).—There was little relationship between the incidence of mastitis and the methylene blue reduction time of milk, indicating that in its present form this test is of no use for the detection of mastitis.

V. *Mastitis in relation to cheese-making*, J. G. Davis and J. McClemont (pp. 94-103).—The possible causes of the unsuitability of mastitis milk for cheese making are classified and discussed. Abnormal chemical composition of such milk is considered the real factor involved.

VI. *General observations, summary, and conclusions*, J. G. Davis and J. McClemont (pp. 104-107).—The incidence of mastitis was shown to increase steadily with advancing age of animal. A general summary of the preceding reports is presented.

The value of indirect methods for the detection of mastitis, S. J. Rowland and M. Zein-El-Dine (*Jour. Dairy Res.* [*London*], *10* (*1939*), *No. 1*, *pp. 108–113*).—The results of 8 indirect tests for subclinical mastitis were compared with the bacteriological findings in a series of milks. On the basis of agreement with the direct bacteriological method casein number ranked first, followed in order by chloride content, amount and character of centrifuge deposit, solids-not-fat content, bromocresol purple reaction, bromothymol blue reaction, presence of clots, and catalase content.

The physiological types of bacteria in milk in relation to reduction of methylene blue, R. N. Davis and K. W. Lines. (Univ. Ariz.). (*Jour. Dairy Sci.*, *22* (*1939*), *No. 4*, *pp. 209–218*, *figs. 2*).—Approximately 1,000 milk samples studied for physiological types of bacteria present in relation to methylene blue reduction time were found to contain on the average 6.27 percent acid-coagulating bacteria, 55.82 acid-noncoagulating, 11.59 acid-coagulating-gas-proteolytic, 2.28 alkaline, and 2.83 percent inert bacteria. A wide seasonal variation in

physiological types in milk was noted. The acid-noncoagulating types which predominated in most high quality milk were poor reducers of methylene blue, but proteolytic types were good oxygen receivers and played an important role in reduction. Marked variations in physiological types present in individual samples failed to have any material effect on reduction time, suggesting that the associative action between bacteria overshadows any individual variation of reduction power.

The part played by bacteria in the reduction of methylene blue in milk, B. C. HOBBS (*Jour. Dairy Res. [London], 10 (1939), No. 1, pp. 35-58, figs. 4*).—In a study at the London School of Hygiene and Tropical Medicine, pure cultures of the more common forms of organisms present in high-quality raw milk were isolated and subjected to various tests. When grown in raw sterile milk the coliform group of organisms caused most rapid reduction of methylene blue, followed in order by *Streptococcus lactis* and some of the fecal streptococci *Staphylococcus aureus, S. albus, S. citreus,* some micrococci, group C hemolytic streptococci, certain strains of *Streptococcus agalactiae*, and aerobic spore bearers. There appeared to be little relationship between rate of oxygen absorption and the rate of methylene blue reduction for the various groups, but a fairly high correlation between the rate of fall in the oxidation-reduction potential and rapidity of reduction. Reduction appeared to be almost entirely a result of the metabolic reactions proceeding on the cell surface of the bacteria, indicating that the methylene blue reduction test affords a good index of the extent of bacterial metabolism in milk.

Methods of measuring gas production, L. A. ALLEN (*Jour. Dairy Res. [London], 10 (1939), No. 1, pp. 1-6, figs. 4*).—This contribution from the University of Reading describes an apparatus and methods for measuring gas production in various dairy products. The apparatus can be readily adapted to either aerobic or anaerobic conditions.

Gas production by Bacterium coli and by lactic acid streptococci under different conditions, M. M. HASSOUNA and L. A. ALLEN (*Jour. Dairy Res. [London], 10 (1939), No. 1, pp. 7-19, figs. 8*).—Employing the above-described method, the gas production by *B. coli* and lactic acid streptococci in pure cultures and various combinations was determined. When vigorous strains of *Streptococcus lactis* and *B. coli* were inoculated together in skim milk, a preponderance of the former type inhibited gas production by the latter, but with a larger inoculum of *B. coli* gas production occurred, the amount of gas formed depending on the relative size of inocula of the two organisms. A pure culture of *B. coli* in skim milk yielded only carbon dioxide, while pure cultures in lactose or dextrose broth under similar conditions yielded both hydrogen and carbon dioxide. Thus it appeared that the common gaseous defects in milk and milk products due to coliform organisms are primarily attributable to carbon dioxide and that the effect of hydrogen is negligible. The types of lactic acid streptococci commonly used in starters, whether in pure or mixed cultures in skim milk, skim milk plus yeast extract, or evaporated milk, did not yield measurable quantities of gas.

Protein metabolism and acid production by the lactic acid bacteria in milk: Influence of yeast extract and chalk, M. BRAZ and L. A. ALLEN (*Jour. Dairy Res. [London], 10 (1939), No. 1, pp. 20-34*).—Pure and mixed cultures of various strains of lactic acid bacteria were grown in sterile milk either unsupplemented or with additions of chalk and yeast extract. Growth of these organisms in milk resulted in a concomitant synthesis and degradation of proteins and their split products, with a general tendency to show an increase of protein after several weeks' incubation which was derived primarily from the proteose-peptone fraction. When yeast extract was added to the milk

much more acid was developed and the viability of the culture decreased, presumably due to the lethal effect of the extra acid. Additions of chalk which neutralized the acid markedly increased the rate of proteolysis. There was no evidence that the proteolytic power of the organisms was linked with acid-producing power.

Pasteurizing cream for butter making, C. Jensen (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 5, pp. 25, 26*).—A study was made of the effect of temperature and length of the holding period during pasteurization of the cream on the keeping quality of butter. In series 1, comparing temperatures of 145°, 155°, and 160° F. each for 30 min., the average score of fresh butter from the 155° lot was slightly higher than the others. However, the keeping quality of the butter when held at from 40° to 50° increased with increase in pasteurizing temperature. In series 2, comparing 145° for 30 min., 155° for 20 min., and 160° for 15 min., the last lot gave the highest scoring fresh butter while the lot pasteurized at 155° gave butter possessing the best keeping qualities.

A study of the chemistry of incipient oxidation defects in butter, C. R. Barnicoat and L. S. Palmer (*Minnesota Sta. Tech. Bul. 134 (1939), pp. 63*).—A series of experiments on the oxidation of butter constituents gave evidence that oxidation of the lecithoprotein is responsible for the development of incipient off-flavors such as flat, bitter, stale-storage, and metallic, the latter being most objectionable. The oxidation of the lecithoprotein "membrane" material in cream was evidently transmitted to the triglycerides of the fat globule, since in most instances the oxidation is eventually reflected by an increase in the fat-oxidation value. The membrane oxidized more readily in the presence of catalysts, such as copper or ferrous iron or in the absence of certain natural antioxygenic substances, and may occur long before there is any evidence of oxidation in the butterfat. Other experiments to determine whether nonfat ingredients were oxidizable gave negative results. No evidence of oxidized proteins could be found in commercial butters, and the plasma ingredients proved to be highly antioxygenic. Butters made from washed creams or synthetic creams (butterfat emulsified in egg lecithoprotein) were invariably of rank, metallic, or oxidized flavor. Off-flavors of the metallic type frequently improved during storage, suggesting that oxidation of lecithoprotein may reach a stage where on further oxidation the defective flavor is lost. In such cases a stale-storage flavor finally resulted. Other experiments testing the protective effect of relatively high concentrations of vitamins A, B, C, D, E, and G and nicotinic acid indicated that of these only vitamins C and E possessed any antioxygenic properties. The protective effectiveness of other plasma ingredients, particularly inorganic salts, were much more striking. Theories regarding the oxidation changes occurring in butter are explained at length.

Starter cultures for cheese manufacture: Maintenance of acid-producing activity in cultures of lactic streptococci, H. R. Whitehead and G. J. E. Hunter (*Jour. Dairy Res. [London], 10 (1939), No. 1, pp. 120–132*).—The occasional failure of single-strain cultures of streptococci used as starters in Cheddar cheese manufacture is attributed to the apparently spontaneous appearance of bacteriophage. Increasing the amount of inoculum used in the starter and consequently shortening the lag period when starter was added to each new batch of milk proved an effective way of overcoming this difficulty in most instances.

The white particles in mature Cheddar cheese, F. H. McDowall and A. K. R. McDowell (*Jour. Dairy Res. [London], 10 (1939), No. 1, pp. 118, 119*).—Analyses of the white specks occurring in mature Cheddar cheese indicated that they were calcium lactate.

Determining the efficiency of ice cream mix pasteurization through the use of the phosphatase test, A. J. HAHN and P. H. TRACY. (Univ. Ill.). (*Jour. Dairy Sci., 22 (1939), No. 4, pp. 219–228*).—A study of the applicability of the phosphatase test to ice cream mixes indicated that within certain limits this test can be used as a check on the efficiency of pasteurization. Pasteurization temperature of 147° F. or below were not sufficient to result in any appreciable inactivation of the enzyme, indicating that the additional solids in the ice cream mix act as a protective agent for phosphatase. Moreover, pasteurization temperatures of 147° or below sometimes resulted in variable phenol values dependent on the heat treatments previously given dairy products going into the mix, suggesting the necessity of establishing standard phenol values for complete pasteurization at various temperatures. Coloring and flavoring materials also affected the accuracy of the test.

Certain factors affecting the phosphatase test when applied to ice cream, W. J. CAULFIELD and W. H. MARTIN. (Kans. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 4, pp. 261–270*).—A study of the influence of various ice cream ingredients on phosphatase behavior during pasteurization indicated that sugar protected this enzyme against inactivation at temperatures of 142°, 143.5°, and 145° F. for 30 min., while portions of the same mix pasteurized without sugar gave negative phosphatase reaction at these temperatures. However, pasteurizing at 150° for 30 min. inactivated the enzyme regardless of the presence or absence of sugar. The use of excessive amounts of certain vanilla flavors significantly influenced the phenol value of the ice cream mix. Additions of small amounts of raw milk or cream to a pasteurized mix could be detected either by the Gilcreas and Davis or the New York field phosphatase test, but at pasteurization temperatures of 150° the holding period had to be materially shortened below 30 min. before it could be detected by either of the above methods. Homogenization, freezing, and holding ice cream at the usual hardening and storage temperatures had no apparent effect on the results of the phosphatase test.

VETERINARY MEDICINE

[Report of work in animal pathology by the Kentucky Station] (*Kentucky Sta. Rpt. 1938, pt. 1, pp. 5–8*).—The work of the year referred to (E. S. R., 79, p. 534) includes transmission experiments with periodic ophthalmia in horses, incoordination in young horses, the finding of equine encephalomyelitis in a brood mare in Fayette County, and a study of paratyphoid bacilli.

[Work in animal pathology by the Massachusetts Station] (*Massachusetts Sta. Bul. 355 (1939), pp. 94–97*).—The work of the year briefly reported upon (E. S. R., 79, p. 534) includes pullorum disease eradication, diagnosis, mortality studies of cottontail and white hare rabbits imported into Massachusetts, infectious bronchitis immunization of poultry, pullorum disease in turkeys, and viability of *Salmonella pullorum*, all by H. Van Roekel, K. L. Bullis, O. S. Flint, and M. K. Clarke; and studies of neoplastic and neoplasticlike diseases, by C. Olson, Jr.

[Work in animal pathology and parasitology by the Wyoming Station] (*Wyoming Sta. Rpt. 1938, pp. 15, 16, 17, 18, 23–25, 27*).—Work with selenium and other mineral elements affecting plant quality, poisonous oat hay and oat straw, poisonous plants, coryza (roup) in chickens, infectious abortion in ewes, calf diphtheria, and equine encephalomyelitis, and transmission experiments with avian coccidiosis are briefly considered in this report (E. S. R., 79, p. 103).

Diseases of animals: Prevention and treatment, F. C. MINETT (*Jour. Roy. Agr. Soc. England, 99 (1938), pp. 164–194*).—A review is given of the progress of work with foot-and-mouth disease, infectious bovine abortion, control of bovine

tuberculosis, and virus diseases of horses, swine, and poultry. A list of 25 references to the literature is included.

[Contributions on animal pathology and parasitology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 11 (1938), No. 1, pp. 9–104, 247–255, figs. 54*).—Among the contributions presented (E. S. R., 81, p. 274) are: Studies on the Neurotropic Virus of Horsesickness—VI, Propagation in the Developing Chick Embryo, by R. A. Alexander (pp. 9–19) (E. S. R., 78, p. 100); South African Helminths—III, Some Mammalian and Avian Cestodes (pp. 23–50) (E. S. R., 81, p. 274), IV, Cestodes From Columbiformes (pp. 51–61), and V, Some Avian and Mammalian Helminths (pp. 63–104), all by R. J. Ortlepp; and The Toxicity of Some Dipping Fluids Containing Arsenic and Sulphur, by D. B. Steyn and P. M. Bekker (pp. 247–255).

An improved medium for the storage of Actinomyces necrophorus cultures, E. A. Tunnicliff. (Mont. Expt. Sta. et al.). (*Jour. Infect. Diseases, 63 (1938), No. 1, pp. 113–116*).—A description is given of a special anaerobic medium especially useful for the storage of *A. necrophorus* cultures. The medium has supported "the uninterrupted viability of nine strains throughout a storage period of 469 days at room temperature. As the medium is regularly employed in this laboratory, routine transfers of the stock cultures of *A. necrophorus* are made every 3 mo. Seven of 10 strains of *A. necrophorus* carried in it from 1.5 to 7 yr., with transfers at intervals of about 3 mo., have retained their pathogenicity."

[Contributions on helminth parasites] (*Helminthol. Soc. Wash. Proc., 6 (1939), No. 1, pp. 1–8, 10, 11, 21–23, 29, 30, figs. 2*).—Contributions presented are: Two New Nematodes (Trichostrongyloidea) From Rodents, by G. Dikmans (pp. 1–4) (U. S. D. A.); Notes on Parasites of Horses in Hawaii, by A. O. Foster and J. E. Alicata (pp. 4–8) (Univ. Hawaii et al.); and On the Life History of *Moniezia expansa* and *Cittotaenia* sp. (*Cestoda: Anoplocephalidae*), by W. H. Krull (pp. 10, 11), Effectiveness of the Swine Sanitation System in Controlling Swine Stomach Worms in the South, by D. A. Porter (pp. 21–23), and A Note on the Parasite Fauna of the Hawaiian Islands, by L. E. Swanson (pp. 29, 30) (all U. S. D. A.).

Life history of the nematode Cooperia curticei, and development of resistance in sheep, J. S. Andrews. (U. S. D. A.). (*Jour. Agr. Res. [U. S.] 58 (1939), No. 10, pp. 771–785, figs. 3*).—The results of an investigation, conducted through 1934, 1936, and 1937, of the life history of *C. curticei*, a nematode parasitic in the small intestine of sheep and goats, with a more or less cosmopolitan distribution, are reported. The findings reveal the life history to be very similar to that of other trichostrongyles. Infective larvae developed from the eggs in about 5 days at room temperature. They lost their sheaths soon after entering the host and migrated into the crypts of the intestinal mucosa about 3 days after infection. They underwent the third ecdysis in the crypts on about the fourth day, and returned to the lumen of the intestine on about the fifth day after infection, where they remained for the balance of their life. The fourth ecdysis occurred on the ninth day, the worms matured on about the fourteenth day, and eggs were found in the feces as early as the fifteenth day after infection. Sex differentiation of the larvae was possible at the beginning of the fourth stage. Lambs receiving daily doses of larvae over a relatively long period of time developed a resistance against superinfection. The resistance was evidenced by the production of nodules about the larvae in the crypts of the intestinal mucosa. The nodules were found to be similar in structure to those reported by other workers. A list is given of 44 references to the literature cited.

The coyote as a host to Physaloptera felidis Ackert 1936, O. W. Olsen, R. Fenstermacher, and B. S. Pomeroy. (Minn. Expt. Sta.). (*Cornell Vet., 27 (1937), No. 3, p. 327*).—Nematodes to the number of 20 that were collected from a coyote trapped in Minnesota were identified as *P. felidis*. The species was described by Ackert in 1936 from cats in Kansas (E. S. R., 76, p. 64).

Some notes on the chemical control of the free-living stages of bursate nematodes, I. W. Parnell (*Canad. Jour. Compar. Med., 3 (1939), No. 3, pp. 84–87*).

Susceptibility of the "gopher" (Citellus richardsonii (Sabine)) to Leptospira icterohaemorrhagiae, J. T. Syverton, W. W. Stiles, and G. P. Berry (*Soc. Expt. Biol. and Med. Proc., 39 (1938), No. 1, pp. 113–115*).—Evidence is presented of the susceptibility of the Richardson ground squirrel (*C. richardsonii*) to the etiological agent of Weil's disease *L. icterohaemorrhagiae*.

Flagellar antigens of organisms of the genus Listerella, J. S. Paterson (*Jour. Pathol. and Bact., 48 (1939), No. 1, pp. 25–32, pl. 1*).—A description is given of the flagellar antigenic structure of 27 strains of *Listerella* from a variety of animals.

A comparative study of Listerella and Erysipelothrix, M. Barber (*Jour. Pathol. and Bact., 48 (1939), No. 1, pp. 11–23, pls. 4*).—A comparison of five strains of *Listerella* and six of *Erysipelothrix* is reported. Since it has been impossible to decide finally upon their classification, the two generic names are retained.

Survival of worm parasite infection on New York State pastures, D. W. Baker. (Cornell Univ.). (*Cornell Vet., 29 (1939), No. 1, pp. 45–48*).—Evidence presented in this progress report indicates that in the vicinity of Ithaca, N. Y., the infective stages of the various species of small gastrointestinal worms found in native sheep and calves will remain viable for periods of at least 21 mo. in the case of sheep parasites and at least 9 mo. in the case of bovine parasites.

Allergy in Brucella infections, P. Morales-Otero and L. M. Gonzalez. (Univ. P. R.). (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 1, pp. 100–102*).—Studies under way have shown that there is no correlation between cutaneous allergy to *Brucella* and other "immunological reactions, such as agglutination, complement-fixation, and opsono-cytophagic index." It is concluded that the "cutaneous test should be of value in epidemiological investigations, but until further work is done the cutaneous reaction should not be considered as proof of present or past infection, since it only shows the development of a state of hypersensitiveness in persons that have been in close contact with infected material."

Serological studies on mastitis, F. R. Smith and C. S. Mudge (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 1, pp. 45–48*).—The studies reported have shown that cow sera may contain "streptococcal antibodies which appear to be type-specific. There is evidence of a correlation between the presence of *Streptococcus mastitidis* in the herd and the occurrence of agglutinating antibodies in the serum of the individual cows. It appears probable that infection in an individual herd may be due to a specific type under group B."

The transmission of lymphocytic choriomeningitis by mosquitoes, L. T. Coggeshall (*Science, 89 (1939), No. 2318, pp. 515, 516*).—Transmission experiments with lymphocytic choriomeningitis occurring among rhesus monkeys have demonstrated the ability of the yellow-fever mosquito to transmit the disease to guinea pigs through its bite. The mosquitoes are capable of transmitting the virus as early as the fourth day and at least as late as the fifteenth day after feeding on an infected animal.

Serologic and immunologic studies relative to the viruses of human and swine influenza, D. R. Shaw, A. S. Kenney, and J. Stokes, Jr. (La. State Univ. et al.). (*Amer. Jour. Med. Sci., 197 (1939), No. 2, pp. 247–253*).—A description is given of the development of neutralizing antibodies against the human virus in the sera of swine exposed to human epidemic influenza and the absence in the same sera of corresponding antibodies for swine virus. The appearance in the cross-neutralization tests of antigenic differences in the human influenza viruses is also described and discussed.

Johne's disease infection of laboratory animals with aid of paraffin oil, W. M. Mohler. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 6, pp. 590–594, figs. 2*).—Experiments have shown that when cultures or tissues containing *Mycobacterium paratuberculosis* are emulsified with paraffin oil and then inoculated into guinea pigs, the animals usually develop symptoms of the disease within 2 or 3 weeks and succumb in from 30 to 90 days, although some may linger as long as 5 mo. "In previous experiments these laboratory animals had always proved refractory to inoculations with either saline or distilled water suspensions of material containing *M. paratuberculosis*. Therefore, in paraffin oil we have a new tool or vehicle which, when mixed with *M. paratuberculosis*, is highly capable of infecting laboratory animals, either by reducing their resistance or by increasing the antigenic property or the virulence of the causal organism."

The susceptibility of voles to human and bovine strains of tubercle bacilli, A. Q. Wells (*Brit. Jour. Expt. Path., 19 (1938), No. 5, pp. 324–328*).—It has been found that the amount of human tubercle bacilli which will produce demonstrable disease after introperitoneal injection in the vole (*Microtus agrestis*) after 1 mo. is at least 1 mg. "Extensive and progressive disease has resulted in 1 mo. after injection in all the voles which were injected with bovine tubercle bacilli in amounts varying from 1 mg. to 0.00001 mg. It is suggested that a dose of 0.001 mg. moist weight of culture of tubercle bacilli injected intraperitoneally into voles should distinguish unfailingly between human and bovine tubercle bacilli in 1 mo."

Further observations on acquired immunity to the tick Dermacentor variabilis Say, W. Trager (*Jour. Parasitol., 25 (1939), No. 2, pp. 137–139*).—The author found that guinea pigs can be partially immunized "to larvae of *D. variabilis* by injecting them with extracts of the cephalic glands, salivary glands, or digestive tract of partially engorged adult female ticks, or of the salivary glands of unfed adult females. The serum of rabbits previously infested with *D. variabilis* shows specific complement fixation with a larval tick extract antigen."

The mode of action of sulfanilamide on streptococcus, II, F. P. Gay, A. R. Clark, J. A. Street, and D. W. Miles (*Jour. Expt. Med., 69 (1939), No. 5, pp. 607–624*).—It is concluded that sulfanilamide not only does not completely destroy the *Streptococcus hemolyticus* but does not even impair its innate virulence. "It acts upon the streptococcus not only by inhibiting growth but by a temporary inhibition of hemotoxin formation, but only under certain conditions. The drug does not neutralize hemotoxin already formed. No significant effect of sulfanilamide on the formation of leucocidin or fibrinolysin by streptococcus has been evident in our experiments."

The mode of action of sulphanilamid, P. A. Shaffer (*Science, 89 (1939), No. 2320, pp. 547–550*).

Comparative therapeutic effects of sulfapyridine in experimental Staphylococcus aureus infections in mice, E. A. Bliss and P. H. Long (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 1, pp. 32–34*).—The authors find it quite apparent that the slight therapeutic effect of sulfapyridine is definite

enough to warrant careful clinical trials of the drug in severe staphylococcal infections.

The enzyme urease and the occurrence of ammonia in maggot-infected wounds, W. Robinson and F. C. Baker. (U. S. D. A.). (*Jour. Parasitol., 25 (1939), No. 2, pp. 149–155*).—The larvae of *Lucilia sericata*, recently used as surgical maggots, have been found to contain "the enzyme urease in their tissues and excretions. Urease is present both in nonsterile maggots and in those reared under aseptic conditions. This enzyme, in breaking down urea, produces ammonia abundantly in maggot-infected wounds."

A list is given of 22 references to the literature.

Horses as possible means of spread of Bang's disease among cattle, C. P. Fitch and R. E. Dodge. (Minn. Expt. Sta.). (*Cornell Vet., 29 (1939), No. 1, pp. 29–31*).—The results of testing and retesting two groups of cattle, with the details given in table form, are presented to show a possible transmission from horses and that this phase of Bang's disease control merits careful attention. It is pointed out that under field conditions, and especially in area work, infected horses which are allowed to remain on the farm present a potential hazard.

Results of vaccination with Brucella abortus strain 19 in an infected herd, C. M. Haring. (Univ. Calif. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 6, pp. 587–589*).—A report is made on the use since 1933 of U. S. D. A. Bureau of Animal Industry *B. abortus* strain 19 in vaccinating all heifers born to an infected State dairy herd in California. A preliminary report of the herd was published in 1938 (E. S. R., 78, p. 699).

"As these heifers came into production, they were placed with the old, nonvaccinated cows, many of which were proved to be shedders of *B. abortus*. As the utility of the old cows has decreased, they have been gradually eliminated until now only 10 are left, 1 of which was still shedding *B. abortus* in 1938. No cows or heifers have been brought into the herd from the outside. The vaccinated animals now in milk production total 51, or 19 percent more than the total number in the old, infected herd in 1933. The vaccinated cows have produced 146 normal calves. There have been five abortions and five stillbirths among vaccinated cows, but inoculations and blood tests indicate that these were not caused by *B. abortus*. *B. abortus* of virulent type (not strain 19) was isolated from 2 of the vaccinated cows, neither of which aborted and 1 of which had a titer of over 1:50 when vaccinated at the age of 24 mo. Continued recent tests have failed to demonstrate the organism in the milk or vagina of these 2 cows. There is no evidence that the vaccine organism was transmitted to any of the old, nonvaccinated cows in the herd by association with the vaccinated heifers. When vaccinations were begun, 17 unbred heifers between 12 and 32 mo. of age were given full vaccine doses, and the vaccination titers of some of these animals did not recede to below 1:25 for about 4 yr. No significant persistence of titers has occurred in the balance of the heifers vaccinated between 4 and 12 mo. of age."

A study of the possible relationship between nonspecific mastitis and streptococcic infection of the bovine udder, E. H. Peterson and E. G. Hastings. (Wis. Expt. Sta.). (*Cornell Vet., 29 (1939), No. 1, pp. 11–24, figs. 3*).—Experiments conducted with 10 cows are reported, followed by an account of pathological findings, which have shown that nonspecific mastitis "apparently lowers the resistance of the mammary gland to infection with *Streptococcus agalactiae*. *S. agalactiae* can be quite easily transmitted to quarters affected with nonspecific mastitis by external infection of the teat. Quarters affected with nonspecific mastitis are readily susceptible to internal infection with small numbers of *S. agalactiae*. The physical changes produced in the milk as a result of the super-

Recovery of the virus of equine encephalomyelitis (western type) from human blood serum, B. Howitt (*Science, 89 (1939), No. 2319, pp. 541, 542*).—Recovery from adult human blood serum even after prolonged storage in the refrigerator is reported.

Encephalomyelitis in monkeys, R. W. G. Wyckoff (*Science, 89 (1939), No. 2319, pp. 542, 543*).—When a massive dose of either eastern or western virus of equine encephalomyelitis is instilled intranasally into a young rhesus monkey, it will in most instances succumb to a fatal infection. Symptoms of the two forms of virus have been similar except that as in other animals the eastern has run a shorter course. "Dropping virus into the eye has not resulted in either disease or measurable antibodies. Eastern virus injected intralingually and western virus introduced by stomach tube have proved fatal, but we have not diseased healthy animals by keeping them caged with sick ones." Hyperimmune horse serum has provided passive protection against nasally instilled virus. Incomplete protection has been furnished by serum administered within 3 hr. of infection. In numerous trials no beneficial effect has resulted from such a serum given at and after the time of first temperature rise, even when this serum was equivalent in amount to the injection of 500 cc. into a 150-lb. man. "Animals twice vaccinated with crude chick embryo vaccine have in all but one instance been completely protected against massive doses of intranasal virus. This vaccination has produced antibodies which were present in high titer after eastern, in lower titer after western vaccine injection."

Equine encephalomyelitis and its control, B. M. Lyon (*North Amer. Vet., 19 (1938), No. 12, pp. 22–30*).—This contribution relates particularly to immunity, it having been shown that from the diseased chick embryo equine encephalomyelitis virus may be obtained in a concentration approximately 100,000 times greater than that found in diseased horse brain. Formolized chick embryo vaccine is more antigenic and therefore more effective for immunization than horse brain vaccine. "Horses, as well as guinea pigs, given two doses of chick vaccine may be solidly protected against massive intracerebral injections of virus which proved fatal not only to all unvaccinated animals but to all those animals receiving the horse brain vaccine. Seven days following a single dose of 10 cc. chick vaccine two out of three horses were completely and one partially protected against intracerebral virus exposure fatal to a corresponding number of unvaccinated horses. Tests to show the full duration of protection are incomplete, since sufficient time has not elapsed to show any appreciable lessening of the immunity. To date, however, horses vaccinated with 2 doses of the chick vaccine 4 mo. previous to intracerebral virus exposure were solidly protected against a virus injection fatal to an equal number of unvaccinated horses. Protection has been shown in guinea pigs over a period of 6 mo. Complete protection may be induced with a bivalent vaccine containing eastern and western formolized virus equivalent in amount to the respective monovalent vaccines against both eastern and western virus exposure.

"Following the distribution of approximately 1,500,000 doses during the 1938 season of the chick vaccine, no protection failures have been recorded after completion of the treatment. The disease was recorded up to 5 days following the initial dose, indicating preinfections. Our studies to date indicate a marked increased degree of protection from a 2-dose treatment over that obtained from a single dose, and from our present knowledge we must not rely upon a false sense of security obtained from a single-dose treatment."

The successful treatment of meningo-encephalitis, associated with canine distemper, with sulfanilamide, M. L. Morris and T. J. Murray. (Rutgers Univ. et al.). (*Science, 89 (1939), No. 2308, p. 274*).—The administration of

sulfanilamide in the treatment of dogs suffering from meningoencephalitis associated with canine distemper resulted in the cure of 13 of 14 dogs when sufficient dosage was given by mouth or subcutaneously to maintain the sulfanilamide blood level at not less than 15 mg. percent. It is desirable to maintain this blood sulfanilamide level and that the administration of the drug be started in the initial stage before extensive pathological changes are manifest.

Immunity to salmon poisoning follows treatment of affected dogs with sulfanilamide, J. N. SHAW and C. R. HOWARTH. (Oreg. Expt. Sta.). (*North Amer. Vet.*, *20* (*1939*), *No. 5*, *pp. 67, 68*).—Report is made of an experiment which has shown that immunity to salmon poisoning in dogs is produced by feeding parasitized salmon and treating with sulfanilamide when symptoms appear.

Ineffectiveness of sulfanilamide in the treatment of canine filariasis, H. W. BROWN. (Univ. N. C.). (*Soc. Expt. Biol. and Med. Proc.*, *39* (*1938*), *No. 1*, *pp. 98–100*).—The oral administration of from 0.057 to 0.137 gm. of sulfanilamide per kilo weight to dogs as a single daily dose for a period ranging from 15 to 36 days was ineffective in the treatment of *Dirofilaria immitis*, as judged by microfilaria counts. A week after the conclusion of the sulfanilamide therapy by mouth one dog was given a series of intramuscular injections of a soluble sulfonamide without effect on *D. immitis*. "This treatment consisted of two daily intramuscular injections of 10 cc. of 2.5 percent solution of disodium 4-sulfamidophenyl-2-azo-7-acetylamino-1-hydroxynaphthalene, 3,6-disulfonate (Prontosil, Winthrop). The drug was administered over a period of 9 days. The microfilaria count, which was 250 per cubic centimeter before treatment, rose to 420 on its completion."

Observations on a natural infection with Strongyloides in the dog, D. L. AUGUSTINE and D. G. DAVEY (*Jour. Parasitol.*, *25* (*1939*), *No. 2*, *pp. 117–119*).—The authors conclude from limited observations that while *Strongyloides* of human origin can be readily transmitted to dogs and cats under laboratory conditions, "the species occurring naturally in dogs probably is distinct and should be identified as *Strongyloides canis* Brumpt, 1922."

Some pathological conditions of the anterior portions of the digestive tract of poultry, H. E. BIESTER and L. H. SCHWARTE. (Iowa State Col.). (*North Amer. Vet.*, *20* (*1939*), *No. 5*, *pp. 41–44*, *figs. 3*).

A study of fowl paralysis, C. W. BARBER (*Cornell Vet.*, *29* (*1939*), *No. 1*, *pp. 41–44*).—Report is made on the antemortem diagnosis and therapeutic value of wheat germ oil for fowl paralysis. The duration of the disease was not appreciably affected by the oil.

Propagation of the virus of vesicular stomatitis in the chick embryo, E. A. EICHHORN and C. A. MANTHEI. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, *94* (*1939*), *No. 6*, *pp. 608–611*).—Vesicular stomatitis virus dried in vacuo and held in a refrigerator remained viable for at least 5 mo. "Vesicular stomatitis virus (New Jersey strain) can be propagated in both the developing chick embryo and chorioallantoic membrane. Eleven-day-old embryos are the most suitable, with 40 to 48 hr. of incubation for maximum virus production in the egg. The virulence is increased after successive passages in the chick embryo. Egg-propagated virus is immunologically identical with animal-propagated virus."

The life history of Hymenolepis exigua, a cestode of poultry in Hawaii, J. E. ALICATA and E. CHANG. (Hawaii Expt. Sta.). (*Jour. Parasitol.*, *25* (*1939*), *No. 2*, *pp. 121–127*, *figs. 15*).—A report is made of an experimental study of the development of the tapeworm *H. exigua* in the intermediate host (amphipod, *Orchestia platensis*) and in the final host, which is the chicken. "Eggs of this parasite, when ingested by amphipods, were found to develop

during a period of about 12 days to the cysticercoid stage capable of infecting chicks. Cysticercoids fed to week-old chicks developed to maturity in the duodenum and eggs passed in the droppings of the birds 9 to 10 days after experimental infection. Sowbugs (*Porcellio laevis*), beetles (*Tenebroides nana*), houseflies (*Musca* sp.), and undetermined species of earthworms which were exposed to infection with eggs of *H. exigua* failed to become infected."

Preliminary note on the life history of Subulura brumpti, a common cecal nematode of poultry in Hawaii, J. E. ALICATA. (Univ. Hawaii). (*Jour. Parasitol., 25 (1939), No. 2, pp. 179, 180, fig. 1*).—In studies on cecal worms parasitizing chickens in Hawaii, *S. brumpti* was found in 42 out of 50 sets of ceca examined from birds obtained in Honolulu markets. The following five species of insects collected in poultry farms were found naturally infected with encysted larvae of *S. brumpti*, namely, "(Coleoptera) *Dermestes vulpinus*, *Gonocephalum seriatum*, *Ammophorus insularis*, *Alphitobius diaperinus*, and (Dermaptera) *Euborellia annulipes*. An examination of 20 specimens of insects collected in 1 poultry farm near Honolulu revealed the following incidence of infection: *A. diaperinus* 75 percent, *A. insularis* 90 percent, *E. annulipes* 70 percent. Encysted larvae of *S. brumpti* were also found in grasshoppers, *Conocephalus saltator*, 15 days after they were experimentally fed embryonated eggs of this parasite."

A report of swine erysipelas in turkeys, A. S. ROSENWALD and E. M. DICKINSON. (Oreg. Expt. Sta.). (*Cornell Vet., 29 (1939), No. 1, pp. 61–67*).—A report is made of three outbreaks of swine erysipelas septicemia, thought to be the first in Oregon turkeys, together with a preliminary report of the studies conducted. The possible connection with ovine polyarthritis, the seasonal occurrence, and the preponderance of males affected were noted. This affection of sheep is not known to exist in the section of Oregon where the turkey outbreaks occurred.

Blood alterations in typhlohepatitis of turkeys, with notes on the disease, E. P. JOHNSON and C. J. LANGE. (Va. Expt. Sta.). (*Jour. Parasitol., 25 (1939), No. 2, pp. 157–167, figs. 6*).—The authors have found *Histomonas meleagridis* in cecal discharges of carrier chicks to be extremely pathogenic, as compared to this protozoan in other material and to other channels of administration when introduced into the rectum of turkeys held in a suspended position. "The average differential leucocyte count of normal turkeys maintained under the conditions of this experiment is as follows: Heterophiles 43.4, eosinophiles 0.9, basophiles 3.2, lymphocytes 50.6, and monocytes 1.9 percent. Experimental blackhead disease of turkeys results in a marked disturbance in the blood picture which is characterized by (1) a marked heterophilia of from 8 to 21 percent within 24 hr. of receiving the infective material, (2) a persistence of the heterophilia until death, (3) an irregular monocytosis in some cases, especially in those receiving subcutaneous implantations of infective material, [and] (4) myelocytosis and anemia usually preceding the fatal termination. The sudden marked heterophilia following introduction of infective material indicates that the histomonads penetrate the cecal epithelium and establish themselves in some parenteral position where toxic material results within 24 hr. Natural cases of typhlohepatitis were found to have very similar leucocyte disturbances to those found in the experimentally infected birds. An extensive lesion in the proventriculus due to the adminstration of *H. meleagridis* by way of the mouth is described and illustrated. In no case could intravascular protozoan forms be demonstrated in the experimentally infected birds. The rounded forms . . . are interpreted as macrogamete stages of a blood protozoan resembling *L[eucocytozoon] smithi* and are not related to *H. meleagridis*."

Observations on Capillaria contorta in turkeys, M. W. Emmel (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 6, pp. 612–615, figs. 4*).—A report is made of observations on 3 flocks of turkeys infested with *C. contorta*, consisting of 800, 1,200, and 500 birds, respectively, which showed that the characteristic symptoms were indisposition, weakness, droopiness, emaciation, frequent swallowing, and a penguinlike position of the body. "Macroscopic lesions consisted of catarrhal and hemorrhagic inflammation, thickening, necrosis, and sloughing of the mucosa of the esophagus and crop. Microscopic lesions consisted of areas of hyperplasia, hypertrophy, necrosis, and hemorrhage in the layers of epithelium. *C. contorta* did not penetrate deeper than the basement membrane. A satisfactory treatment consisted of feeding the flocks 5 percent of sulfur in the regular mash for a period of 3 weeks."

Clostridium infection in turkeys, R. Fenstermacher and B. S. Pomeroy (Minn. Expt. Sta.). (*Cornell Vet., 29 (1939), No. 1, pp. 25–28*).—Report is made of an outbreak of disease in a flock of approximately 1,000 turkey hens in which there was a mortality of 2 percent. Losses occurred at the beginning of the breeding season. The atrium of infection was probably wounds that occurred at the time of breeding. The anaerobic infection produced subcutaneous emphysema and edema around the head and thigh. *C. cepticum, C. welchii*, and *C. sordellii*, and a Gram-positive coccus were isolated from the internal organs and subcutaneous tissue of 2 turkey hens.

A survey of the blood parasites of birds caught for banding purposes, C. G. Huff (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 6, pp. 615–620, fig. 1*).—A report is made of the parasites of the blood of wild birds based upon smears taken over a period of 10 yr., the details of which are given in three tables.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations of the Massachusetts Station] (*Massachusetts Sta. Bul. 355 (1939), pp. 52, 53*).—This work included a cranberry storage investigation, by C. I. Gunness, H. J. Franklin, and C. R. Fellers; and a study of frost protection on cranberry bogs and construction of a tobacco seed cleaner, both by Gunness.

[Agricultural engineering investigations by the Wyoming Station] (*Wyoming Sta. Rpt. 1938, p. 30*).—It is noted that four fields have been fallowed with the Peacock damming lister, the eccentric one-way plow, the common stubble plow with the moldboard removed, and the duckfoot cultivator, respectively, with no resulting run-off or soil blowing on any of these fields.

Surface water supply of the United States, 1937.—Part 2, South Atlantic slope and eastern Gulf of Mexico basins (*U. S. Geol. Survey, Water-Supply Paper 822 (1938), pp. VI+266, pl. 1*).—This report presents measurements of flow made on streams in these basins during the year ended September 30, 1937.

Ground-water resources of the Holbrook region, Arizona, M. A. Harrell and E. B. Eckel (*U. S. Geol. Survey, Water-Supply Paper 836–B (1939), pp. IV+19–105, pls. 10, fig. 1*).—The Holbrook region includes most of the drainage area of the Little Colorado River in Arizona, exclusive of the Navajo country.

Semiarid conditions prevail except in the mountainous areas to the south. Dry farming has been unsuccessful. Irrigation is practiced to a very slight extent, its chief restrictions being the lack of water of proper quality and quantity. Cattle and sheep grazing have been conducted successfully and are the chief industries. Sufficient well-water supplies may be developed for present herds, but the region as a whole seems not adapted to further expansion of the grazing industry under present conditions of vegetative cover and its use.

The total dissolved solids in the waters range from 80 to 6,197 p. p. m. Waters from Recent alluvial materials, the Moenkopi formation, and the Chinle formation are commonly high in dissolved mineral matter. The best waters come in large part from the base of the lava flows or of the Tertiary sands and from the Coconino sandstone.

The relationship of stream flow to precipitation on the Salt River watershed above Roosevelt Dam, C. K. Cooperrider and G. G. Sykes (*Arizona Sta. Tech. Bul. 76 (1938), pp. [3]+69, figs. 10*).—A foreword by the director of the station notes that "this bulletin is published by the agricultural experiment station of the University of Arizona in cooperation with the Southwestern Forest and Range Experiment Station in order that the important information it contains may be made available at once to the people of Arizona, to whom such facts are vital in their management of land resources." Its contents deal with the importance of watered areas, need for knowledge about factors that affect water yield, watershed and precipitation characteristics affect water yield, records and analyses, close relationship between precipitation and stream flow on the upper part of the watershed, further tests of relationships of fall and flow, long-time trends, why summer precipitation contributes so little to stream flow, precipitation-stream flow relationships in the lower part of the southwestern watersheds, and application of findings in watershed management.

Flow of water in irrigation and similar canals, F. C. Scobey (*U. S. Dept. Agr., Tech. Bul. 652 (1939), pp. 79, pls. 24, figs. 5*).—On the basis of tests carried on since 1913 (E. S. R., 33, p. 183; 70, p. 838), this bulletin presents a detailed analysis of the factors involved in the design and performance of canals supplying water for irrigation or other uses. Particular attention is given to the choice to be made among various empirical formulas for determining the value of *n*, the coefficient of hydraulic roughness. In addition to evaluating *n* under conditions such that the design will be satisfactory at the critical part of the season, the author finds it necessary to consider prevailing wind direction and notes other important design factors as follows:

"In the design of earth channels having a trapezoidal form when constructed, the computations should be based on the expectation that the canal will take an elliptical form within a short time and thereafter maintain this shape unless altered artificially. Capacity of old rough concrete canals can be materially increased at a fraction of the capital charge for the original construction. Shot concrete should be surface-treated [by striking with a rectangular blade] to secure high capacity. If capacity is sufficient . . . water tightness is better assured without surface treatment, as this includes a tendency toward more porous concrete. Initial high capacity due to smooth surfaces is not a permanent feature where muddy waters predominate. Such water increases the capacity of a very rough channel and decreases the capacity of a very smooth one. Determinations of the values of *n* in experimental research work should not be conducted on the basis of the surface slope. The energy slope is the effective quantity and agrees with the surface slope only for uniform flow, and uniform flow cannot be assumed to be present. Generally it is not. If cross-sectional areas are developed at the ends of a test reach, no matter how uniform the flow looks or should be, it is generally found that these areas are unlike. Hence the velocities are unlike and have different investments of velocity head in their total energy contents."

An outline of the water facilities program (*U. S. Dept. Agr., Soil Conserv. Serv., [pp. 23], figs. 11*).—A popular, profusely illustrated outline is given, indicating what the Federal water facilities program provides, where it applies, who may benefit, manner of handling construction and installation, limitation of size of single projects, repayment of loans, plans for tenants, etc.

Studies on Raritan River pollution, II, 1937–38, W. RUDOLFS (*New Jersey Stas. Bul. 659 (1939), pp. 22, figs. 7*).—In a survey of Raritan River and its principal tributaries, May 1937 to March 1938, it was shown that the natural waters of the Raritan do not change materially in chemical composition, are fairly clear, are the least mineralized in northern New Jersey, and have a low bacterial content. They are, therefore, admirably suited for industrial purposes, are fit for recreational use, and are an excellent source of potable supplies. During a 10-yr. period bacterial pollution has decreased and chemical pollution has increased, the last-named pollution appearing to come mainly from between the towns of Somerville and Bound Brook. The discharge of chemical wastes appeared to interfere with the self-purification and oxidation power of the stream, to be detrimental to fish life, and to prevent the fullest recreational use of the river. It is further noted that "discoloration and annoyance in respect to sailing and rowing craft will continue until the industrial wastes responsible are adequately treated. The bacteriological results show that the river is still unfit for swimming, but it is expected that upon completion of all sewage plants under construction the health hazard will be greatly reduced because of removal of polluting substances and chlorination of effluents discharged." The sludge and other oxygen-consuming substances removed by the treatment in sewage plants were found equivalent to 8,750 lb. of oxygen or to the addition of from 90 to 120 million gallons of clean water daily. It was indicated that intestinal bacteria will be reduced during the summer months (May–October) by 99.9 percent or more, but "until pollution from industrial sources has been alleviated, the general improvement of the river will be less than could be expected from the investment in sewage treatment plants by the various communities." A summary of the newly constructed sewage plants is presented, and the probable purification effects are indicated.

Farm drainage: Its maintenance and construction, E. W. LEHMANN and T. A. PITZEN (*Illinois Sta. Cir. 493 (1939), pp. 40, figs. 31*).—For the maintenance of best farming conditions, more than one-third of the farm lands in Illinois must be artificially drained, and the total of public and private drainage structure investment in the State amounts to about $150,000,000. The authors warn against installation of expensive drainage systems without provision for their regular and thorough repair and efficiency maintenance. The main topics taken up in the circular cover maintenance of open channels, maintaining the tile system, planning a tile system, constructing outlet for tile system, constructing the tile lines, surface inlets and sand traps, and file maps and records. Diagrams, photographs, dimensioned working drawings of various structures, and numerical data of value in the design of drainage systems are included.

Water conduction from shallow water tables, R. E. MOORE (*Hilgardia [California Sta.], 12 (1939), No. 6, pp. 383–426, figs. 20*).—The pressure potential (determined directly from tensiometers placed in the soil) was found to increase in an unsaturated soil at constant moisture content with increasing temperature, and the amount of water held in the soil at a given pressure potential to decrease with increasing temperature. During periods of temperature change in a soil column in which there is a high water table, these relations cause wide variation in the rate of water uptake from a water table. Under field conditions, rapid changes in soil temperature above a water table would be accompanied by rising water tables with rising temperature, and falling water tables with falling temperature. The pressure potential (ψ) of the water films in a soil is a measure of the curvature of the films and an index of the degree to which the soil is saturated. The relation of soil permeability, K, to pressure potential was studied and curves of $K=f(\psi)$ were developed. K could also be studied as a function of P_w (moisture content) through the relationship be-

tween ψ and P_w. Permeability was a maximum at or near saturation and decreased rapidly with decreasing P_w to approximately the moisture equivalent of the soil, at which moisture content the permeability was very low and remained constant or decreased only slightly with further decreases in moisture content. At this point $\delta K/\delta\psi=0$ (approximately). This moisture content is also approximately that of the wetted front generated as the water advanced upward through the dry soil above a water table. These two criteria, the P_w at which $\delta K/\delta\psi=0$ and the P_w of the wetting front, are interpreted as representing the P at which the moisture films in the soil become discontinuous and at which the capillary permeability of the soil is zero.

The effect of texture upon the behavior of the soils used in the experiments here recorded produced the order of permeability for flow in the saturated soil: Sand>fine sandy loam>light clay>clay; and for unsaturated flow at $\psi=-100$ sand<fine sandy loam<light clay<clay. "If arranged in order of decreasing pressure potential at which unsaturated flow is approximately zero, the sequence obtained is: Sand>fine sandy loam>light clay>clay."

Effect of steaming on the strength of southern yellow pine, S. J. Buckman and L. W. Rees. (Minn. Expt. Sta.). (*Amer. Wood-Preservers' Assoc. Proc., 34 (1938), pp. 264-296, figs. 4*).—This study was made on specimens of shortleaf and of slash pines. The trees were from Forrest County, Miss. Comparable groups of clear unseasoned sapwood specimens obtained from five different trees, each specimen being cut 1 by 1 by 34 in., were steamed for periods of time ranging from 3 to 18 hr. and at temperatures ranging from 214° to 260° F. The samples for strength tests were sawed from these specimens after they were steamed. The percentage loss in strength for each steaming period was based on control specimens, not steamed.

The data showed considerable loss in all of the strength properties investigated even at the lower temperatures and for the shorter steaming periods, except in maximum shearing strength parallel to the grain, where the loss appeared too small. The strength properties most affected by the least severe steaming were the fiber stress at the proportional limit in the static bending and compression tests. The losses due to steaming for 18 hr. at a temperature of 260° varied from 18.4 percent for modulus of elasticity to 56.5 percent for stress at the proportional limit in compression parallel to the grain. It was found that there was a recovery of one-fourth to one-half of the loss in strength due to steaming when specimens were tested at a moisture content of 12 percent, as compared with the strength of unseasoned specimens. The largest recoveries occurred in those specimens which had been least severely steamed. These recoveries, however, were not permanent and were found to depend upon the moisture content of the wood at the time it was tested. The data were used to show that the reduction in the strength of a 20-in. pole steamed for 18 hr. is about 31 percent, while the strength of a 58-in. pole steamed for 4 hr. is reduced about 5 percent. Because of this decrease in strength due to steaming, it was recommended that southern yellow pine poles be air-dried prior to preservative treatment.

Preservative treatment of fence posts (*Connecticut [New Haven] Sta. Bul. 421 (1939), pp. 34, 35*).—This report notes the success of various treatments of native woods, used to replace chestnut, with creosote, zinc chloride, etc. It is noted that wind-felled timber left by the hurricane can be so utilized.

Affinity of hydrophilic aggregate for asphaltic bitumen, H. F. Winterkorn. (Univ. Mo.). (*Indus. and Engin. Chem., 30 (1938), No. 12, pp. 1362–1368, figs. 4*).—By means of a wash test following various pretreatments, the author showed t[illegible]pping resistance of bitumen-coated aggregate de-

pends upon the properties of the bitumen, the surface properties of the mineral, and the time and condition of contact between bitumen and mineral surface. Washing with aqua regia tended to improve the adhesiveness more than washing with hydrochloric acid. Samples taken from a bituminous soil stabilization project, in some sections of which resin-forming primers were used, were tested in the laboratory with the result that specimens containing aniline-furfural, high-temperature tar-furfural, and low-temperature tar-furfural admixtures showed better resistance to water than samples which did not contain these materials. "The evidence appears to show that furfural and its resinous derivatives might be destined to fill an important place in bituminous road construction."

Factors which influence the durability of concrete stave silos, D. G. Miller. (Minn. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Concrete Inst., 9 (1938), No. 4, pp. 381–397, figs. 15*).—The author examined about 200 concrete silos in several States and obtained test data on 1,350 experimental concrete silo staves made at 9 commercial plants to determine the effect of mix or number of staves per bag, tamping (the number of tamps per stave), water: cement ratio, and aggregate grading. It is shown by results of permeability tests that the transverse strength and density of silo staves are closely related, and the inference is drawn that the greatest durability may reasonably be expected of those staves having transverse strengths upward from 140 lb. per inch of width when tested by applying the load midway between supports 24 in. apart. It is shown in the report that the 10-min. absorption of a stave, following drying to constant weight at a temperature of 240° F., is a direct measure of permeability. For strengths above 140 lb. per inch of width the quantity of water absorbed after 10 min. is between 1 and 2 percent and is fairly constant. The 10-min. absorption therefore provides a simple test for permeability of dry tamped staves, and thus makes it reasonably easy to correlate strength and density of staves as a basis for studies of durability under exposure conditions found in silos.

Drying seed cotton, F. L. Gerdes, W. J. Martin, and C. A. Bennett (*U. S. Dept. Agr. Leaflet 181 (1939), pp. 8, figs. 3*).—A 17-floor drier at a temperature of 150° F. removed moisture from about 1 lb. per 100 lb. of seed cotton with less than 12 percent moisture to 3 lb. from cotton having 16 percent or more. The percentage removed from each of these cottons at temperatures up to 250° was only slightly greater than at 150°. This result was attributed to the relatively short exposure in the drier (15 sec.) and the fact that the relative humidity of the air heated to the higher temperatures is not appreciably lower than that at 150°. The moisture removed from lint per 100 lb. by drying for 15 sec. at 150° ranged from an average of 1.5 lb. for seed cottons below 12 percent in moisture to an average of 4 lb. for those having 16 percent or more. It increased slightly with higher drying temperatures. Actual differences in the weight of bales due to drying are not permanent. The results of a storage test show that a bale of undried (damp) cotton rapidly lost weight; that a dried bale gained slightly; and that, at the end of 10 weeks, the bales differed in weight by only 4 lb. as compared with 16 lb. at the beginning of the storage period. Fiber was not weakened by drying at 200°, but there was a slight weakening when the material was dried twice at 250°. Staple length, on an average, was preserved at 150°, but, in general, higher drying temperatures resulted in ginned lint with slightly shorter staple length. It was found better to pass wet cotton twice through a drier at 150° than once at a temperature above 200°.

Average improvements in grade of cotton (the combined influence of generally smoother preparation and occasionally brighter color and reduced leaf) result-

ing from artificial drying were greater for the cotton 1⅛ in. and longer than for the shorter staples. Drying at a temperature of 150° with the 17-floor drier showed benefits in grade ranging on an average from about one grade for either length group having 16 percent or more of moisture to about one-third of a grade for the longer cottons having from 8 to 11.9 percent and the shorter cottons having from 12 to 15.9 percent of moisture. The average gain in bale value was from 70 ct. for short staple to $2.50 for long staple cotton as against an operating cost of from 5 to 30 ct. per bale for drying. It was further found that drying usually eliminates chokages and break-down and permits some increase in ginning capacity. Inexpensive cleaner-driers economically practical for the small gin have been devised.

As sources of heat, steam, engine-cooling water and engine exhaust, and furnace heating are mentioned, and the possibilities of combinations of these sources are briefly indicated.

Requirements in tobacco barn construction (*Kentucky Sta. Rpt. 1938, pt. 1, p. 53*).—Observation of the formation of temperature and humidity zones in tobacco barns indicated that it will probably be necessary to use forced air circulation in some form in order to maintain optimum conditions in all parts of such barns.

Old laying houses can be modernized, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 198 (1939), pp. 62–64, fig. 1*).—The suggestions given are also deemed applicable to new construction.

***Human and physical resources of Tennessee.*—XVI, Electrical resources and development,** C. E. ALLRED, S. W. ATKINS, and W. E. HENDRIX (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 64 (1937), pp. [1]+IV+264–278, figs. 7*).—It is stated that only New York State, Oregon, and Washington have more potential water power per square mile than does Tennessee. The last-named State ranks tenth, however, in developed hydroelectric power. The rapid development since construction of the first modern hydroelectric plant in the State in 1909 is outlined. The number of plants and of electric power companies has decreased more than 50 percent since 1924. Electric transmission lines were found to reach nearly all counties of Tennessee. Since 1920 Tennessee has averaged about twenty-sixth in the United States and about fifth in the Southeast in production of electricity. The annual production since 1929 has averaged slightly over one billion kilowatt-hours. In 1936, 75 percent of the electricity was produced by water power and 25 percent by fuels. The importance of fuels in producing electric power has declined considerably since 1933. The largest use of fuels is in late summer and early fall, when stream flow is usually low. The largest users are wholesale commercial customers, principally large industrial companies. Farm power ranks lowest.

AGRICULTURAL ECONOMICS

[Articles and notes on agricultural economics] (*Jour. Farm Econ., 21 (1939), No. 2, pp. 435–461, 470–478, 489–511, figs. 7*).—Articles are included on Germany's Bid for Agricultural Self Sufficiency, by B. Higgins (pp. 435–461), and Status of Agricultural Trade Unions in Holland, by S. C. Sufrin (pp. 470–478) (Ohio State Univ.); notes as follows: Intensity and Land Rent—A Reply, by D. L. MacFarlane (pp. 489–494) (Univ. Ky.) (E. S. R., 81, p. 290); Some Economic Aspects of University Patents, by W. H. Nicholls (pp. 494–498) (Iowa State Col.); Type of Farming Research Again, by C. L. Holmes (pp. 498–500), and Relation Between Corn and Wheat Futures, by M. Clough (pp. 500–502) (both U. S. D. A.); Agricultural Adjustment and Marketing, by H. E. Larzelere (pp. 503–507) (Mich. State Col.); and Recent Farm Loan and Real

Estate Experiences of Five Leading Life Insurance Companies, by J. H. Dickerson (pp. 507–511) (Iowa State Col.); and a correction on an article by Wells and Du Pré (p. 511) (E. S. R., 81, p. 290).

[Investigations in agricultural economics by the Kentucky Station, 1937–38] (*Kentucky Sta. Rpt. 1938, pt. 1, pp. 26–34*).—In addition to studies previously noted, general findings are reported for studies of seasonal fluctuations in Burley tobacco prices and in quality of tobacco; regional variations in farm prices of tobacco; farm organization and management of 81 farms in 1937 in southern Christian, Todd, Simpson, Warren, and Trigg Counties, and of 152 farms in 1935 and 61 of the same farms in 1937 in central and northern Robertson County; cost of raising beef calves to weaning age; land utilization in Taylor County; and farm tenancy.

[Investigations in agricultural economics by the Massachusetts Station, 1937–38] (Partly coop. U. S. D. A.). (*Massachusetts Sta. Bul. 355 (1939), pp. 6–9, 51*).—Included are some preliminary findings by C. R. Creek and M. Butler as to factors affecting income during the year ending April 1937 on 253 dairy farms in 11 counties, the labor income on 54 dairy farms selling milk on retail routes, and the farm management and practices on 3 farms in the Nashoba fruit area; and by Creek and J. E. Donley of factors affecting labor income on 71 wholesale, 34 retail, and 9 breeding poultry farms in the 7 eastern counties of the State. Findings as to duplication of distribution are reported by A. A. Brown and W. Kling in a study of milk as a public utility, and suggested solutions with and without governmental intervention are made. Findings are also reported in studies of competitive factors influencing the supply of market milk and cream in the State, by Brown and Donley; of the economic aspects of marketing fluid milk in Worcester, Mass., by Donley and C. W. Smith; and of land-use problems in Massachusetts in relation to a balanced program of land utilization, by D. Rozman.

Current Farm Economics, [April 1939] (*Oklahoma Sta., Cur. Farm Econ., 12 (1939), No. 2, pp. 33–64, figs. 4*).—In addition to the usual tables of index numbers of prices, demand deposits, and prices and purchasing power, articles are included on the agricultural situation, by the staff of the department of agricultural economics and extension specialists; the poultry and egg situation for 1939 and 1940, by M. Hill; development of cotton production in Brazil, by K. C. Davis; and some aspects of land ownership in Nowata County, by R. T. Klemme.

Foreign Agriculture, [May 1939] (*U. S. Dept. Agr., Foreign Agr. Serv., Foreign Agr., 3 (1939), No. 5, pp. 167–218, figs. 3*).—Included are articles on Southeastern Europe's Trade Increasingly Dominated by Germany, by H. Richter (pp. 169–174); Effects of the Drought and Purge on the Agriculture of the Soviet Union, by L. Volin (pp. 175–196); and Agriculture in the French Balance of Trade, by N. W. Hazen (pp. 197–215); and notes on recent developments in foreign agricultural policy as follows: Minimum-price fixing in Argentina includes part of cattle industry, Institute of Territorial Credit established in Colombia, Manitoba to regulate marketing of natural products, and Turkish tobacco legislation.

Farm tenancy in South Dakota, H. P. Hanson (*South Dakota Sta. Cir. 25 (1939), pp. [4]+26, figs. 15*).—Included among other data are tables for eastern and western South Dakota and maps showing by Federal Census period 1910–35 by counties the percentages of total farmers that were tenants, full owners, part owners, and managers, the size and value of farms by tenure groups, and the per acre value of lands and buildings in 1935.

Economic criteria for classifying nonurban land according to probable best use, D. Weeks and H. R. Josephson. (Univ. Calif.). (*Jour. Farm Econ.,*

21 (1939), No. 2, pp. 419–434).—Using the findings in land utilization investigations in the northern Sierra Nevada foothills of California as a basis, several economic criteria for the classification of land are discussed with a view to indicating their usefulness as an economic basis for locating appropriate margins between different uses or combination of uses of land, and judging the optimum geographical limits within which given land-use policies may be applied.

Farm adjustments in Montana.—Study of area VII: Its past, present, and future, N. W. JOHNSON. (Coop. U. S. D. A. et al.). *(Montana Sta. Bul. 367 (1939), pp. 59, figs. 6).*—This is the first of a series of bulletins constituting part 2 of Bulletin 328 (E. S. R., 76, p. 708), and deals with the area included in Hill, Liberty, and Toole Counties, a dry-farming area. The physical and other features of the area, the trends in number and size of farms, acreage of crops, livestock production, etc., are discussed. The physical conditions, ownership of land, types of farming, economic condition of farming, and conditions needing change in the seven subareas of area 7 are discussed. The need for adjustments in the area, the standards for measuring adjustments, the adjustments in farm organization and practices, and problems and possible magnitude of adjustments are discussed. Appendixes describe the sources of data and methods used in the analysis.

Supplementary tables for Bulletin 367: Types of farming in Montana.—II, Major area VII: Past, present, and future. (Coop. U. S. D. A.). *(Montana Sta. Mimeog. Cir. 10 (1938), pp. [35], fig. 1).*—This supplements the bulletin noted above.

Changes in technology and labor requirements in crop production: Wheat and oats, R. B. ELWOOD, L. E. ARNOLD, D. C. SCHMUTZ, and E. G. MCKIBBEN *(Works Prog. Admin. [U. S.], Natl. Res. Proj. Rpt. A–10 (1939), pp. XV+182, figs. 36).*—"Of the factors influencing the productivity of labor used in crop production, mechanization and agronomic developments are of prime importance. By the use of machines operations are performed with less labor, and agronomic discoveries tend to result in higher yields. In the sphere of small-grain production, agronomic developments during the past 25 yr. have resulted in maintaining the average yield of wheat during a period when more and more of the crop was being raised in dry areas where yields are normally low and during a period when much of the crop was raised under conditions tending to deplete soil fertility. The yielding ability of wheat grown today is, in all probability, greater than it was 25 yr. ago. The development of superior varieties will no doubt continue to be a factor in reducing per-bushel labor requirements in the future.

"In the past, however, agronomic developments have been overshadowed by mechanization. In fact, the use of machines in raising wheat is a classic example of the mechanization of agriculture. A century ago the production of an acre of wheat required nearly 60 man-hours; in 1896, with machine methods, about 9 hr. were required in the central Winter Wheat Belt; today, with the most modern machinery, it requires less than 5 hr. and in some regions not more than 2 or 3 hr. of work. Although most of the reduction in labor needs occurred prior to the period 1909–36, within that period labor requirements per acre of wheat have declined by more than 50 percent."

The economic situation facing New Jersey vegetable growers, J. W. CARNCROSS and A. G. WALLER *(New Jersey Stas. Bul. 660 (1939), pp. 59, figs. 42).*—Tables and charts present data as to acreages, yields, and values of fresh vegetables in the United States by sections and New Jersey, 1919–34, prices of vegetables, farm products and fertilizers, wholesale prices of all commodities, and farm wages and farm taxes in New Jersey 1910–37. Data were presented

regarding the business in 1937 on 25 vegetable farms in Monmouth County and 2 in Gloucester County, the trends of prices of individual vegetables in New Jersey 1910–37, the average value per acre of different vegetables in New Jersey 1925–29 and 1933–37, and the relations of size to net income from truck farms and of costs to labor income in 1937. The markets for New Jersey vegetables, changes in supplies, relation of market supply and price, and seasonal variation in prices are discussed.

The acreage of vegetables grown for sale in the United States increased 165 percent from 1919 to 1934, while the population increased about 20 percent. The index of prices of vegetables 1933–37 for New Jersey averaged approximately 23 percent lower than that for all farm products. For the period 1920–29 that for vegetables was 20 percent higher. The average labor income in 1937 on the 25 specialized vegetable farms in Monmouth County was −$946. Prices of many vegetables were as low or lower than the 1910–14 average. Gross value per acre of many vegetables was much lower during the period 1933–37 than the period 1925–29. Relatively small size of business was one of the problems confronting the industry. Of the 25 specialized vegetable farms in Monmouth County studied in 1937, 10 with sales averaging approximately $14,800 had an average labor income of $114, while 15 with sales averaging $2,172 had an average labor income of −$1,653. The 12 with yields averaging 27 percent above the average for all farms had a labor income of $553, and 13 with yields approximately 25 percent below the average had a labor income of −$2,329.

Economic aspects of hybrid corn, A. A. Dowell and O. B. Jesness. (Minn. Expt. Sta.). (*Jour. Farm Econ., 21 (1939), No. 2, pp. 479–488*).—The probable effects on acreage, production, distribution of production, costs, land values, prices, etc., are discussed.

Fruit trees in the Wenatchee-Okanogan District, Washington, W. W. Rufener (*Washington Sta. Bul. 369 (1939), pp. 55, figs. 19*).—This buletin presents an analysis similar to that for the Yakima Valley (E. S. R., 80, p. 260). Tables, maps, and charts show for apple, pear, apricot, peach, cherry, plum, and prune trees data as to distribution, age, varieties, etc., of trees obtained in the Tree Fruit Census of 1936.

Of the approximately 2,600,000 fruit trees in the district, about 75 percent were apples, 13 pear, 6 apricot, 3 peach, 3 cherry, and 0.6 plums and prunes. Of the apple trees 26.2 percent were less than 10 yr. of age and 46.9 percent 17 to 26 yr. old. Approximately 6 percent of the trees in 1934 in the southern part of Chelan and Douglas Counties, and 25 percent of those in the Grant County-Moses Coulee area were pulled in 1935 and 1936. The major trends in apple production have been a decline in the total number of trees, an increase in the importance of the northern part of the district, and an increased preference for Delicious varieties, particularly Red Delicious. Materially increased production of pears, apricots, peaches, and cherries is indicated by the fact that nearly 50 percent of the pear, 55 percent of the apricot, 66 percent of the peach, and 53 percent of the cherry trees were less than 10 yr. of age. Red Delicious apples, d'Anjou pears, Hale peaches, and Bing cherries have been favored by producers in the plantings during 1931–35.

Milk distribution costs of producer-distributors and subdealers in New Jersey, E. H. Rinear (*New Jersey Stas. Bul. 663 (1939), pp. 56, figs. 14*).—Records were obtained by personal interviews covering the operation in 1936 of 63 producer-distributors in 4 markets in the northern and 3 markets in the southern part of the State, and 47 subdealers in 2 markets in the northern part. The importance of total volume of milk handled in the State, the volumes

handled by producer-distributors and subdealers, price schedules followed, and the milk control board prices and margins are discussed.

The average total investment in plant and equipment was $3,037 for the producer-distributor and $981 for the subdealers, being $2.77 per 100 qt. volume for grade B producer-distributors in north Jersey and $2.20 in south Jersey. The range and average costs per 100 qt. volume for producer-distributors and subdealers, respectively, were: Interest 9 to 18 ct., average 12 ct., and 1 to 5 ct., average 3 ct.; depreciation 9 to 35 ct., average 14 ct., and average ⅛ ct.; delivery and collection (excluding labor) 71 ct. to $1.83, average $1, and $1.30 to $1.34, average $1.33; other costs 80 ct. to $1.95, average $1.08, and 25 to 39 ct., average 31 ct.; and total costs (excluding labor) $1.92 to $3.54, average $2.43, and $1.60 to $1.74, average $1.67. Total costs of grade A producer-distributors averaged $2.31 in north Jersey and $2.86 in south Jersey as compared with $2.31 and $2.46, respectively, for grade B producer-distributors. Total hours of labor per 100 qt. volume ranged from 4.8 to 6.9, average 6.1, for the producer-distributors and from 3.6 to 3.8, average 3.8, for the subdealers. Returns from labor ranged from 70 ct. to $1.74 per hour, average $1.19, and from 80 to 81 ct., average 81 ct., respectively. Returns from labor averaged $1.57 per hour for grade A producer-distributors in north Jersey and $1.64 in south Jersey. For grade B producer-distributors the averages were 99 and 65 ct., respectively. The study showed that small distributors can have as low or lower costs than large distributors, but usually do not, and that there was a tendency for producer-distributors to use labor more efficiently when 100,000 qt. or more were sold annually.

Evolution of a plan for intra-association shifting of the capital obligations among members, H. E. Erdman and W. W. Taylor. (Univ. Calif.). (*Jour. Farm Econ., 21 (1939), No. 2, pp. 462–469*).—This is a case study of the new features developed in the financial structure of the Poultry Producers of Central California, a successful nonstock cooperative association.

Cooperative purchasing in Washington, E. F. Dummeier (*Washington Sta. Bul. 371 (1939), pp. 28*).—This is a popular bulletin describing and discussing the meaning of cooperation, what constitutes a cooperative society, cooperative marketing and purchasing in the United States and the State of Washington, the future of cooperative purchasing, and cooperative purchasing in Washington of feed, petroleum products, fruit and vegetable growing and packing supplies, other side lines, groceries and general merchandise, and services.

The greatest success in cooperative purchasing in Washington has occurred where previous marketing methods involved unnecessary duplication of facilities and selling efforts; with staple commodities, which purchasers desired in large volume, and which could be standardized as to quality; where one staple or group of products assured volume of business; where expenses were kept low in relation to volume of sales, and credit was limited so there was little or no risk; where there was capable and enthusiastic leadership, good judgment in filling managerial positions, and adequate, accurate accounts kept; where there was adequate financing but no unnecessary expensive plants; where there was a system of paying patronage dividends in cash or membership interest in capital of the association; and in the case of feeds and petroleum products where the chain store method was used of combining in one organization or closely affiliated organizations wholesaling or jobbing and retailing services.

State trade barriers: Selected references, L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List. 1 (1939), pp. 16*).—This is a mimeographed and indexed list of 63 annotated references.

Seasonal aspects of the European wheat trade, M. K. BENNETT (*Wheat Studies, Food Res. Inst.* [*Stanford Univ.*], *15* (*1939*), *No. 6, pp.* [*2*]+*297–335, figs. 14*).—"Overseas shipments of wheat and flour to Europe in August–December, when North American wheat usually preponderates, have ranged in the past 17 crop years from 37.4 to 44.55 percent of the crop-year shipments. A view rather widely accepted in trade circles is that the fraction of the year's total shipped in these months tends to be small when the margin between world export surpluses and world import requirements is large. Under such circumstances, it is commonly supposed that European importers tend to avoid accumulation of stocks in August–December in expectation of cheaper wheat in the winter when the Southern Hemisphere export movement is at its peak. The present study indicates that the reverse of this is true. Autumnal accumulation of import wheat stocks appears to be normal behavior of European importers in years of large margin of surpluses over requirements, mainly as the result of export pressure in the autumn. In general, August–December shipments to Europe may be expected to approximate 43.3 percent of crop-year shipments in years when margins (as calculated in this study) run larger than 250 million bushels."

Index numbers of production, prices, and income, J. I. FALCONER (*Ohio Sta. Bimo. Bul. 198* (*1939*), *p. 70*).—The series (E. S. R., 81, p. 432) is brought down through February 1939.

Laws affecting agriculture [in North Dakota], D. G. HAY (*North Dakota Sta. Bimo. Bul., 1* (*1939*), *No. 5, pp. 27–34*).—This is a summary of certain laws enacted by the 1939 North Dakota Legislature relating to property taxation, county government, public lands, soil conservation, livestock, marketing, cooperatives, mortgages, and education.

RURAL SOCIOLOGY

Washington country weekly newspapers, their distribution and characteristics, **1902–1938**, C. F. REUSS (*Washington Sta. Bul. 373* (*1939*), *pp. 30, figs. 7*).—Information included in N. W. Ayer and Son's Directory of Newspapers and Periodicals for all weekly newspapers of the State except those published in Seattle, Tacoma, and Spokane, for the years 1902, 1910, 1920, 1930, and 1938, is analyzed to show for the western, central, and eastern divisions of the State the trends in numbers of newspapers, population of towns, business units per town, and characteristics of the newspapers (day of publication, number of columns, politics, subscription price, and circulation). The causes of the disappearance of newspapers and the characteristics of those disappearing are discussed.

The number of weekly newspapers increased from 159 in 1902 to 252 in 1914 and decreased from 250 in 1918 to 180 in 1921, and was 185 in 1938. Since 1910 the proportion of papers in villages of less than 1,000 population increased. In 1930 and 1938 80 percent of the towns and cities of 1,000 or more population and 50 percent of the villages and towns of from 500 to 999 population had a weekly newspaper. The average number of persons per newspaper was 2,282 in 1902 and 5,476 in 1938. The number of persons per copy issued increased from 2.9 to 4.8. From 1902 to 1930 the proportion of newspapers having a circulation of less than 1,000 copies decreased and that of papers with a circulation of from 1,500 to 2,499 copies increased. In 1938 there was an increase in the proportion of papers of small circulation and a decrease in those with circulations over 1,500. Average circulation increased 47 percent from 1902 to 1938. By

1938, 125 of the 236 weekly newspapers published in 1910 and 46 of 194 published in 1930 had disappeared. The analysis indicated that the greatest chance for survival for a weekly newspaper is for one published on Thursday or Friday in a town of from 1,000 to 3,999 population and with a circulation of from 500 or 750 to 2,000 copies, and where the paper is more strictly a newspaper than an adjunct to a job printing shop or a legal publications sheet.

A portrait of the farm family in central New York State, H. W. Beers (Rutgers Univ.). (*Amer. Sociol. Rev., 2 (1937), No. 5, pp. 591–600*).—The portrait of today's farm family in central New York is a modification of old patterns, a partial acceptance of new patterns. It is smaller than the pioneer family, yet it is still among our chief sources of population increase. The rural social organization of the area is no longer familistic, but it is at least "semifamilistic." There is a definite heritage of paternal dominance, but its outlines become progressively more dim. Specialization and education have affected the division of labor, but shared work and shared leisure are still formative of the family pattern. Propinquity continues to foster solidarity, resisting the centrifugal effects of urbanization. Definite democratization in the changes of role and status accelerates with the advance of business efficiency and industrialization in agriculture. Both rate and direction of future change in the farm family pattern are, therefore, as likely to depend upon larger economic and social influences affecting agriculture as upon the dictation of tradition.

It is deemed significant that the family pattern of these farm folk is so widely valued today. As an accepted design for living, it is a stated or implied goal of those current governmental efforts at agricultural adjustment which propose to make the family farm more general and more secure.

Farm population (*Kentucky Sta. Rpt. 1938, pt. 1, pp. 34, 35*).—An analysis of Federal census data as to rate of natural increase, race, and net migration in Kentucky is briefly noted.

Research in causes of variations in fertility: Social psychological aspects, L. S. Cottrell, Jr. (Cornell Univ.). (*Amer. Sociol. Rev., 2 (1937), No. 5, pp. 678–685*).—Negative relations were found between fertility rates and the degree of urbanization of a given population, the position in the social-economic scale as indexed by income and occupational status, the occupational rank, educational achievement, and between fertility rates and the indices of social-economic emancipation of women.

Rural relief trends in Wisconsin from 1934 to 1937, G. W. Hill and R. A. Smith (*Madison: Univ. Wis. Press, 1939, pp. [5]+57, figs. [6]*).—This report discusses the rural families on relief as to residence, age characteristics, size of family, occupational training, employability, and relief costs per family. Included also is a discussion of the trend in costs and cases.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the Association of Land-Grant Colleges and Universities (*Assoc. Land-Grant Cols. and Univ. Proc., 52 (1938), pp. [1]+V+357*).—This is the report of the meeting held at Chicago November 14–16, 1938 (E. S. R., 80, pp. 1, 143, 145). It includes the papers and discussions presented at the general sessions, and the sections on agriculture, resident teaching, experiment stations, extension work, engineering, and home economics; the minutes of the executive body; reports of committees; and lists of officers and committees for the succeeding year. Memorial tributes to H. W. Mumford, L. D. Coffman, and J. R. Ricks are also included.

FOODS—HUMAN NUTRITION

[Food and nutrition studies of the Massachusetts Station] (*Massachusetts Sta. Bul. 355 (1939), pp. 26, 27, 36–38, 38, 70–72, 73, 74, 75–77*).—Included in this progress report are summaries of studies, several of which represent a continuation of earlier work (E. S. R., 79, p. 561), by J. E. Fuller and W. B. Esselen, Jr., on the influence of calcium salts on the fecal flora of albino rats and on the influence of bacteria on the oxidation of ascorbic acid (vitamin C) (pp. 26, 27); by G. R. Vitagliano and Fuller on gum production by *Aerobacter aerogenes* (p. 27); by Fuller and E. R. Higgins on the relationship of onion juice to bacterial growth (p. 27); by M. E. Freeman and W. S. Ritchie on chemical changes in cooking of vegetables (pp. 36, 37); by Ritchie on changes in meat stored in frozen condition (pp. 37, 38); by W. Mueller and Ritchie on the content of lead in samples of chocolate and cocoa (p. 38); by H. S. Mitchell, G. M. Cook, and O. A. Merriam on the cause and control of nutritional cataract (pp. 70–72) (E. S. R., 80, p. 859); by Mitchell, M. Goldfaden, and G. Hadro on the relation of iodine or other minerals to the prevention of cholesterol-induced atherosclerosis in rabbits (p. 73); by C. R. Fellers, J. A. Clague, and A. S. Levine on methods of preserving apples (p. 74); by Esselen and Fellers on the effects of relatively large amounts of vitamin B_1 and B_2 in addition to optimum amounts of vitamin C on the cure of scurvy in guinea pigs (pp. 75, 76); by Levine, M. G. O'Connor, and Fellers on the preservative effects of acetic and benzoic acids (p. 76); by Fellers, Levine, and Esselen on the preservation and food value of cranberries (pp. 76, 77); by J. Novick and Fellers on currant juice and jelly (p. 77); and by M. E. Lyons and Fellers on the vitamin C content of potatoes (p. 77).

[Food and nutrition studies by the Wyoming Station] (*Wyoming Sta. Rpt. 1938, pp. 21–23*).—This progress report (E. S. R., 79, p. 129) summarizes studies on the effect of age and method of storage on the activity of three types of bakers' yeast, the calibration of pressure cooker gages for the high altitude of the station, doughnut cooking at high altitudes, the vitamin C content of potatoes in storage as determined by titration, and the culinary qualities of several varieties of potatoes.

Adhesion of potato-tuber cells as influenced by temperature, C. J. Personius and P. F. Sharp. (Cornell Univ.). (*Food Res., 3 (1938), No. 5, pp. 513–524, figs. 4*).—In this and the following paper some phases are reported of a study of the effect of heat on potato-tuber tissues in an effort to develop satisfactory objective tests for potato mealiness.

Tensile strength of slices of potato tissue was determined by a technic and apparatus developed for the test. Considerable attention was given to the method of cutting test pieces of the potato tissue. The size of the tuber from which the sections were cut, the plane of cut, and the weight and extensibiliy of the section under stress did not affect the tensile strength, nor was any relationship noted between the tensile strength of the raw tuber and the variety or texture. Higher tensile-strength values were obtained from inner medullae than outer medullae. Consequently a definite sampling method had to be worked out in order to obtain comparable results for tensile-strength values.

Tubers cooked to the point of being readily mashed with a fork gave tensile strengths of 0.7 kg. per square centimeter or less, with a customary value of 0.5 kg. When potatoes were cooked at different temperatures until done, or nearly done, no appreciable reduction in tensile strength occurred during 48 hr. at temperatures of 50° C. (122° F.) or lower. At higher temperatures the

rate of reduction in tensile strength increased with the temperature to a relatively constant value. When these constant values were plotted against the temperature, it became evident that the weakening of the cement wall takes *place to a certain extent at any temperature between 45° and 75°. At a* given temperature the weakening goes to a certain point and stops, after which it is only by increasing the temperature that the process can continue. The *complete weakening of the cement substance can be brought about at 75°* with higher temperatures increasing the speed of completion of the reaction. As this temperature is below the gelatinization temperature of the starch, it is *concluded that cell separation and gelatinization are independent. No difference* was noted between soggy and mealy potatoes in the adhesion of the cells of the raw or cooked tissue.

Permeability of potato-tuber tissue as influenced by heat, C. J. Personius and P. F. Sharp. (Cornell Univ.). (*Food Res., 3 (1938), No. 5, pp. 525–538, figs. 8*).—The possibility of a relation between the loss of adhesion between the cells, starch swelling, and alterations in the permeability of the potato-tuber tissue was investigated, with alterations in the electrical resistance of sections of the tissue used as an indication of the changes in tissue permeability and as a method of investigating the possibility that in the final stages of cooking separation of the tissue cells might occur with the formation of intercellular air spaces. A special conductivity cell devised for the measurement is described and illustrated by a diagram, and the data obtained in its use are presented in curves obtained by plotting the logarithm of the resistance of the sample against the internal temperature.

No significant difference in the effect of heat on the permeability of the tissue of soggy and mealy potatoes was noted. In both, the resistance decreased slowly during the first 8 or 10 min. of heating, while the internal temperature of a sample was increased to about 60° C.; but in the next 2 or 3 min., during a temperature rise of about 10°, the resistance decreased very rapidly and then more slowly within the remaining 15 or 20 min., until the internal temperature reached approximately 100°. The temperature range in which the change in permeability was most abrupt was the same as that at which most of the starch of the potato began to swell or became gelatinized. The increase in resistance of starch suspensions at the point of gelatinization or swell was masked in the potato tissue by the rapid increase in permeability of the tissues at this point. Failure of the resistance to increase appreciably at the end of the cooking period is thought to indicate that little or no formation of intercellular air spaces occurs in potatoes during cooking.

Passage of a 110-v. alternating current through potato sections markedly decreased the resistance at temperatures considerably below the minimum temperature of 60°, at which the resistance was first lowered in ordinary cooking. This was attributed to the uniform resistance offered by the tissues with resulting localized heating. This method of applying heat locally to specific *parts of the tissue is thought to open up many possibilities for investigation.*

Bacteria, enzymes, and vitamins—indices of quality in frozen vegetables, D. K. Tressler. (N. Y. State Expt. Sta.). (*Refrig. Engin., 36 (1938), No. 5, pp. 319–321*).—Based on the author's extensive investigations of frozen vegetables, three criteria for judging the quality of most frozen vegetables are proposed, namely, bacterial count, catalase and peroxidase tests, and determination of ascorbic acid content.

A bacterial count under 80,000 per gram shows that the product was blanched at a high enough temperature to kill practically all of the bacteria on the surface of the fresh vegetable, that the blanched product was quickly and

adequately cooled in water free from gross contamination and kept cool through the preparation period, was packed in clean packages in a clean and sanitary plant and frozen rapidly to prevent the multiplication of bacteria during this operation, and that the frozen vegetable had not been allowed to thaw at any time during storage, transportation, or marketing. With careless handling at any time from preparation to marketing, the bacterial count would be at least 100,000 or possibly 200,000 or more per gram.

The absence of the enzymes catalase and peroxidase indicates that the vegetable was sufficiently blanched not to develop off-flavors or lose color during storage at 0° F. or lower for a period of 1 yr. If either the catalase or peroxidase activity exceeds 1 percent of that of the unblanched vegetable, the product has probably not been blanched sufficiently and should immediately be placed in storage at the lowest available temperature. It is noted that the catalase and peroxidase tests are also of great help in determining the proper blanching time for novel vegetable products.

A normal or high vitamin C content for the vegetable in question is considered good evidence that the vegetable was not overmature at the time of harvesting and was properly handled during the operation preparatory to freezing, and that the frozen product was stored in a sufficiently low temperature—0° or lower. Values considered normal for the vitamin C content of certain carefully handled frozen vegetables are peas 0.17 mg. ascorbic acid per gram, lima beans 0.18, spinach 0.50, broccoli 0.80, sweet corn 0.08, and snap beans 0.14 mg. ascorbic acid per gram.

The preparation of rhubarb juice, H. G. Beattie and C. S. Pederson (*New York State Sta. Cir. 185 (1939), pp. 4*).—The method described yields a cloudy full-bodied juice which is said to contain the full aroma and flavor of the rhubarb better than the clear juice obtained by the method previously noted (E. S. R., 75, p. 718). The principal difference is the omission of the clarification procedure with a pectin enzyme preparation. Oxalates are removed as in the earlier method, and the product is pasteurized, preferably in a flash pasteurizer, as described in Circular 181 (E. S. R., 79, p. 583).

Health values of pickles and kraut, C. R. Fellers. (Mass. State Col.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 18 (1939), No. 9, pp. 276, 283; also in Canner, 88 (1939), No. 20, p. 14*).—This is an abstract of a paper presented at the Technical School for Pickle and Kraut Packers. Vitamin C, lactic acid, and salt are emphasized as the most important constituents of both sauerkraut and genuine dill pickles. Tank kraut is said to contain twice as much vitamin C per unit volume as canned tomato or pineapple juices. Processing and dilution with salt brine reduce the vitamin C values. Genuine dill pickles contain only about 10 percent as much vitamin C as kraut. Their laxative effect is thought to be associated with the pectin present and possibly to some extent with lactic acid.

Household storage of fruits and vegetables, R. E. Robinson (*Canada Dept. Agr. Pub. 632 (1938), pp. 8*).—Directions applicable to Canadian conditions are given for the home construction of a storage room for fruits and vegetables and the selection of material suitable for storage, with specific directions for apples, potatoes, onions, cabbage, cauliflower, celery, squash and pumpkin, tomatoes, several root vegetables, and sweetpotatoes.

Survey of national nutrition policies, 1937–38 (*Genève (Geneva): League of Nations, Econ. and Financ., 1938, II A 25, pp. 120*).—This report is based chiefly on the reports furnished by various governments during 1938 to the League of Nations concerning certain aspects of national nutrition policies and

on the discussion of representatives of national nutrition committees at a conference held in Geneva in October 1938. The first two chapters give a brief account of the work of the Technical Commission on Nutrition of the League since 1936 and the scope and functions of the national nutrition committees organized at the recommendation of the "mixed committee." The remaining six chapters constitute an analysis of the types of activities in which these national committees are engaged and an indication of the lines along which certain of them are developing. The greatest emphasis is given to dietary surveys and their results in certain countries. Next in importance appears to be the action taken in various countries with a view to improving nutritional standards. Attention is also given, although to a less extent, to special research problems, economic aspects of the nutrition problem, and education and publicity. A list of the countries from which reports on nutrition progress were received and summaries of the composition, procedure, and terms of reference of the national nutrition committees are given as appendixes.

Nutrition of the Union population, E. H. Cluver (*Jour. Roy. Sanit. Inst.*, *59* (*1938*), *No. 2, pp. 99–107*).—In this paper, presented before the South African Health Congress held at Johannesburg February 14–19, 1938, data are presented from a study conducted by the South African Office of Census and Statistics on the food expenditures of European families in certain urban areas of the Union. The figures reported include the consumption per man unit (international scale) per month of different classes of food according to certain income categories and the relative consumption of the same items in the three income categories up to £175, £325–£400, and £525–£600.

In terms of the values for the lowest income group as 100 percent, the values increased for the other two groups in the items bacon, eggs, fresh milk, cheese, fresh fish, vegetables and fruits, butter, jams and sirups, and fresh meat and decreased in the items potatoes, oatmeal, rice and corn meal, sugar, bread and flour, tea and coffee, and condensed milk. The extent of increase over the basal decreased in the order named from bacon with values of 1,830 and 2,230 percent to meat with values of 112 and 112 percent, respectively, for the upper two income groups. Of the food items showing decreases with increased incomes, the range was from potatoes with values of 99 and 92 percent to condensed milk with values of 42 and 15 percent, respectively. None of the dietaries fell below 3,000 calories per man unit. The protein averaged 98 gm. per man unit for the low income group and 132 gm. for the highest income group. In both 60 gm. came from vegetable sources. In the two lowest income groups calcium fell to 0.49 gm. per man unit.

It is emphasized that these figures are for European families with definite incomes and that the situation was probably much worse in the native population. As an illustration of an extreme example, reference is made to measures which have to be taken to prevent the rapid development of scurvy in the native mine workers who arrive for work in apparently satisfactory health. The explanation is that a large proportion of the native population is in a subscorbutic state, with no reserves of vitamin C. Definite symptoms arise only when muscular work is undertaken. The same situation is thought to be true with regard to pellagra, which is very apt to develop when the naturally indolent natives are forced to work, as in prisons.

Nutrition studies (*Connecticut* [*New Haven*] *Sta. Bul. 421* (*1939*), *pp. 18, 19*).—Progress is reported on a study of the requirement of calcium and phosphorus for skeletal development in rats and of the utilization of calcium from green leaves. A completed study of the effect on young rats of intraperitoneal injection of thymus extract is noted with negative results as regards stimulation of growth and development.

The scope of investigations in nutrition in the experiment station, D. KNOWLES (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 5, pp. 19, 20*).—This is a general discussion of the relation to State problems of the various projects constituting the research program in nutrition at the station.

A long-time study of nitrogen, calcium, and phosphorus metabolism on a low-protein diet, B. L. KUNERTH and M. S. PITTMAN. (Kans. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 2, pp. 161–173*).—A contribution to the problem of the necessary length of time for metabolism studies is presented in this and the following paper, which give the results of nitrogen, calcium, and phosphorus balance studies in a series of 15 consecutive 3-day tests on low- and medium-protein diets.

In this study, three young women serving as subjects subsisted on a constant low-protein diet in which ground beef round furnished 85 percent of the nitrogen of an allowance planned to provide 75 percent of the protein requirements of the subjects. The diets also furnished calcium at a level of 92 percent and phosphorus at a level of 97 percent of the commonly accepted standards of 0.68 and 1.32 gm., respectively, per 70 kg. body weight. All of the subjects showed considerable variation in the retention of nitrogen, calcium, and phosphorus from period to period, with no definite cyclic tendency. Two of the subjects were in positive nitrogen balance throughout the 15 periods. The other, although having an average balance close to equilibrium, was decidedly negative in 2 periods and slightly so in 2 other periods. Two of the subjects were in positive calcium balance in only 2 and the other in 3 of the 15 periods. The phosphorus balance was negative in 9, 10, and 10 periods of the 3 subjects. There were also variations from period to period in the coefficients of digestibility and in the total urinary acid. Two menstrual periods for each subject occurred during the study. In 4 of the 6 periods, nitrogen and calcium appeared to be retained in amounts above the average and in 1 below. Phosphorus was retained in amounts above the average in half of the periods and below in the other half. The authors conclude that "measurement of the utilization of nitrogen, calcium, and phosphorus in young women subjects on moderately low-protein diets requires a long-time consecutive balance study, the length of time probably depending on the subject."

A long-time study of nitrogen, calcium, and phosphorus metabolism on a medium-protein diet, M. S. PITTMAN and B. L. KUNERTH. (Kans. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 2, pp. 175–185*).—This study was conducted along similar lines to the one noted above and with the same three subjects and an additional one, the only difference in set-up being an increase in the protein to 1.2 gm. daily, 87.7 percent of which came from beef. This medium-protein diet did not eradicate the tendency to variation in the retention of nitrogen, calcium, and phosphorus observed on the low-protein diet. Balances for nitrogen and phosphorus were in all cases positive, but none of the subjects was in positive calcium balance although the retentions were improved over those on the low-protein diet.

Nutritive value for growth of some proteins of fishery products, W. B. LANHAM, JR., and J. M. LEMON (*Food Res., 3 (1938), No. 5, pp. 549–553*).—The fish and beef proteins used in this comparative study were prepared by successive extractions of the ground product with acetone, followed by continuous extraction with acetone for 14 hr. The dried and ground product was fed to young rats at a 9-percent level in a diet consisting otherwise of butterfat 8, Osborne and Mendel salt mixture plus a trace of copper and zinc 4, a commercial vitamin concentrate from milk 4, alcoholic extract of wheat embryo 10, cod-liver oil 2, and dextrin to make 100 parts by weight. The diets were fed ad libitum over a period of 10 weeks to rats of an initial weight of about 50

gm., and the gains in weight were recalculated for differences in protein intake by the Fisher method of covariant analysis as used by Titus and Harshaw (E. S. R., 73, p. 366). As thus adjusted and the oyster protein given a growth-promoting value of 100, the other proteins fell roughly into three groups, with pilchard, red snapper, shrimp, and Boston mackerel as 90; shad, cod, croaker, and silver salmon as 80; and beef as 63.

Dextrose in the food industries and its health status, C. R. FELLERS. (Mass. Expt. Sta.). (*Amer. Jour. Pub. Health, 29 (1939), No. 2, pp. 135–138*).—This review of the physical, chemical, and physiological properties of dextrose, or refined corn sugar, its present use in the food industries, and its hygienic aspects closes with the statement that "refined dextrose as marketed today in the United States presents no important public health problems." A list of 23 references to the literature is appended.

The influence of hydrogenation and oxidation of fats upon their rate of absorption, M. H. IRWIN, J. WEBER, H. STEENBOCK, and T. M. GODFREY. (Wis. Expt. Sta.). (*Amer. Jour. Physiol., 124 (1938), No. 3, pp. 800–803*).—Following the technic described in a previous report (E. S. R., 77, p. 132), the authors have determined the rate of absorption in rats of a vegetable oil hydrogenated to iodine numbers ranging from 44.7 to 108.3 and melting points ranging from below to well above body temperature (from 10° to 49° C.). Oxidized fats were also tested similarly to determine the effect of rancidity upon the rate of absorption. Variations below body temperature in the melting point of the hydrogenated fats had no effect upon the rate of absorption, but as the melting point increased above body temperature the rate of absorption showed a slight decrease. The rate of absorption of hydrogenated fats was found to vary inversely with the degree of oxidation.

The availability of iron in various foods, L. ASCHAM, M. SPEIRS, and D. MADDOX. (Ga. Expt. Sta.). (*Jour. Nutr., 16 (1938), No. 5, pp. 425–436*).—Certain foods were tested for available iron by the biological method of hemoglobin regeneration in rats made anemic by a milk diet supplemented with copper and by the chemical method of determining ionizable iron with α,α-dipyridyl, following the modified technic of Shackleton and McCance.[4] Arranged in decreasing order of percentage of total iron in ionizable form as determined chemically, the values obtained for the material air-dried at 60°–65° C. and ground to pass through a 40-mesh sieve were mustard greens with 95 percent of the total iron in ionizable form; turnip greens and kale 75 each; spinach 70; leaf and head lettuce, tendergreen, and collards 60; and blackeyed peas (cooked before drying) 55 percent. When fed to anemic rats at the same level of ionizable iron, 0.3 mg. daily, or supplemented with $FeCl_3$ to give a total of 0.3 mg. of iron daily, the order of effectiveness proved to be blackeyed peas and spinach, turnip greens and kale, collards and mustard, head lettuce, and least effective tendergreen and leaf lettuce. Canned collards and canned turnip greens, with both leaves and liquid present in proportional amounts, proved more effective in hemoglobin regenerating properties than the dried materials fed in amounts furnishing the same quantity of ionizable iron.

The suggestion of Smith and Otis (E. S. R., 78, p. 282) that the discrepancies between ionizable and available iron contents of certain foods may be due to a relatively high roughage content did not appear to apply, for Celluflour additions to the milk-iron diet were without effect. The authors conclude that "whatever the factor or factors influencing the utilization of iron, the value for the ionizable iron content of a food does not appear to be a reliable measure of the iron which is available to the body for hemoglobin production."

[4] Biochem. Jour., 30 (1936), No. 4, pp. 582–591.

The metabolism and retention of lead in growing and adult rats, J. B. SHIELDS, H. H. MITCHELL, and W. A. RUTH. (Univ. Ill.). (*Jour. Indus. Hyg. and Toxicol.*, 21 (1939), No. 1, pp. 7–23).—Following a discussion of the problems which have arisen in connection with the use of lead arsenate sprays to control insect pests on fruits and vegetables and washing solutions to remove the spray residue, particularly the question of a safe but practical tolerance for lead, a study is reported in which data were obtained in a series of experiments planned to determine the relationship between the lead content of the diet and the appetite, growth (or maintenance), and retention of lead in the bodies of rats at different periods of growth. The paired feeding method was used throughout, with one of the animals in each pair receiving no lead and the other lead administered as $PbHAsO_4$ in doses consisting of multiples or simple fractions of 26.7 mg. per kilogram of the ration, equivalent to 16 mg. of lead. Three different rations of low but determined content of lead were used in the course of the investigation. The dithizone color method, as modified by Clifford and Wichmann (E. S. R., 76, p. 150), was used for the determination of lead in the food and the carcasses of the rats. In a comparison of the effects of lead on growth, appetite, and retention of lead, 15 paired feeding experiments involving 240 rats were conducted. In 6 of these, young rats weighing about 50 gm. at the beginning of the experiment; in 5, partially grown animals weighing from 150 to 200 gm.; and in 4, mature rats weighing from 250 to 360 gm. were used.

Growth of the young rats and maintenance of weight in the mature rats were not impaired by concentrations of lead as high as 144 p. p. m. (the highest level tested) during periods of from 8 to 17 weeks. There was likewise no appreciable effect on health and appetite. The retentions of lead varied with the age of the animal. During the period of rapid growth there was evidence of retention at such low levels of intake as 2 p. p. m. of dry food. With increased dosage the retention increased in a parallel fashion. The animals in the later stages of growth and the mature animals did not show significant retention of lead until a certain critical concentration in the food had been reached at between 32 and 48 mg. per kilogram of dry food. The final concentration of lead in the bodies could not be raised above 9 to 9.5 p. p. m. in these two groups, but was raised to two or three times this value in young rats. The accumulated stores of lead in the young animals were shown to be much more stable than the stores accumulated after maturity. This is attributed to the fact that in the young animals the greater part of the lead is found in the large shaft of the bone, where it would be held tenaciously; while in the older, full-grown animals the store is entirely confined to the trabeculae, from which it is readily mobilized by the same agents which mobilize calcium. Absorption and digestion experiments conducted in smaller groups of animals indicated that lead is not absorbed from the stomach but is absorbed increasingly throughout the small intestine and possibly to the same extent in the cecum and colon. Most of the lead excreted from the body during the period of lead feeding was accounted for in the feces. On a ration containing 50 p. p. m. of lead, only about 10 percent of the excreted lead appeared in the urine.

Further studies on zinc deficiency in rats, E. HOVE, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 124 (1938), No. 3, pp. 750–758, figs. 2).—A new basal ration for the study of zinc deficiency in rats which permits better growth when zinc is added than the one used in earlier studies (E. S. R., 78, p. 569) is described, and analyses of tissues or whole carcasses of zinc-deficient rats and controls with added zinc are reported. The chief difference in the diet is the use of a liver product extracted with dithizone to remove the zinc in place of the milk serum of the previous study. On this

new diet the total daily intake of zinc of the male rats used in the experiment amounted to only about 7 μg. However, the ration was still not sufficiently low in zinc to bring about any marked reduction in the concentration of zinc in the soft tissues from that in control rats receiving 100 μg. of zinc daily. There was a very slightly higher concentration in the zinc of the livers of the controls and a marked difference in the bones and teeth, suggesting that the lower concentration in the animals on a deficient diet represents an attempt to mobilize zinc stores in order to maintain an essential concentration in the soft, cellular tissues. Aside from a greatly retarded growth rate, no definite symptoms were observed in zinc-deficient animals. Occasionally there was a slight reddening and incrustation around the eyes, nose, and feet, explained as well as the denuding and graying observed in the earlier study as being due either to slower intestinal absorption or increased requirement of this factor by the body cells. Pancreatic enzymes, especially proteinase and amylase, were shown to have a lessened activity in the zinc-deficient rats, but this is thought to be a secondary effect related to a general state of metabolic debility.

Diet and rate of depletion of hepatic vitamin A, E. J. Lease and H. Steenbock. (Wis. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 1, pp. 85–90*).—In continuation of the general investigation of the factors affecting vitamin A storage, experiments following the general plan noted previously (E. S. R., 81, p. 453) were carried out to determine the effect of high-, low-, and rancid-fat rations and of the rapid depletion of excess fat from the livers by the use of choline on young rats with uniform reserves of vitamin A produced by giving 1,500 blue units of the vitamin as halibut-liver oil daily for 4 days. Analyses of the livers of a few animals from each group after 14, 28, and 56 days of depletion showed no significant difference in vitamin A stores of rats which had been fed 30 percent of moderately rancid lard and the same amount of fresh lard. A similar comparison with older rats of fresh and very rancid lard again showed similar depletion rates. There was also no difference in the depletion of vitamin A reserves in young rats which had been on high- as compared with low-fat diets and in those whose liver fat had been depleted by the use of choline and those not receiving choline.

The biological value of carotene in various fats, E. J. and J. G. Lease, H. Steenbock, and C. A. Baumann. (Wis. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 1, pp. 91–102*).—The effect of various fats as solvents for carotene and vitamin A on the storage of vitamin A in the livers of young rats was tested by the same general methods noted above. Tests were also made of the same fats on growth-promoting properties of carotene and vitamin A dissolved in them and on their ability to cure ophthalmia. The possible destructive effect of the fats on both carotene and vitamin A was tested, and where destruction was shown to have taken place the amounts of the fats were adjusted so that equal quantities of carotene and vitamin A were fed. Under these conditions and with excessive amounts of carotene or vitamin A, no marked differences in storage were obtained with lard, soybean oil, cottonseed oil, devitaminized butterfat, and a hydrogenated vegetable fat as the solvents. Approximately equal growth responses were obtained with 1 μg. daily of carotene dissolved in cottonseed oil, soybean oil, lard, decolorized butterfat, coconut oil, or crude peanut oil. Growth was inferior when the solvent was triolein, linseed oil, or "refined" peanut oil, but the rate of cure of ophthalmia was essentially the same on all of the oils.

Changes in fat, carbohydrate, and protein appetite in vitamin B deficiency, C. P. Richter, L. E. Holt, Jr., B. Barelare, Jr., and C. D. Hawkes (*Amer. Jour. Physiol., 124 (1938), No. 3, pp. 596–602, figs. 3*).—The self-selection method has been applied to determine if the recognized disturbance in car-

bohydrate metabolism and the more efficient fat metabolism in rats deprived of vitamin B (complex) are reflected in the animals' appetites and if there are any alterations in the protein appetites which might suggest abnormal protein utilization. Nine rats on an adequate self-selection diet were deprived of vitamin B (complex) by the removal of yeast from the diet, and records were kept of their consumption of the different food items, which consisted of sucrose and casein (autoclaved and purified) and olive oil, cod-liver oil, 3 percent sodium chloride, 2.4 percent calcium lactate, and water in inverted drinking bottles. With the development of the deficiency state in about 30 days, the rats showed a marked aversion to carbohydrates and proteins and a craving for fat. The average daily protein intake decreased from 26 to 5 calories percent, carbohydrate intake decreased from 51 to 11, and the fat intake increased from 23 to 84 calories percent. When yeast was again supplied, the animals ate large quantities of it, and the intake of fat decreased and that of carbohydrate and protein increased. The aversion toward protein is thought to suggest a disturbance of protein utilization which has not yet been detected by biochemical methods.

Deficiency of vitamin B_1 in hookworm anaemia, A. McKenzie (*Lancet [London], 1939, I, No. 20, pp. 1143–1145, fig. 1*).—Two cases of hookworm anemia in male African natives were rapidly cured of edema by treatment with vitamin B_1 after treatment with iron and a generous diet had been without effect. In each case the administration of vitamin B_1 in the form of 2 or 4 mg. of betaxin was followed by increased diuresis. The results of the treatment are thought to suggest "that the edema which accompanies hookworm anemia is due to a deficiency of vitamin B_1, which is in turn due most probably to loss of vitamins in the blood extracted from the host by the hookworm."

Nicotinic acid and prevention of nutritional panmyelophthisis in rats, P. György (*Soc. Expt. Biol. and Med. Proc., 37 (1938), No. 4, pp. 732–734*).—In continuation of the study noted previously (E. S. R., 79, p. 713), the author presents a preliminary report of an experiment conducted on rats receiving the vitamin B_6-deficient diet supplemented by nicotinic acid. During the first 8 weeks of the experimental period 20 rats died from panmyelophthisis. Upon the addition of the nicotinic acid supplement the panmyelophthisis was completely suppressed, and no animal died during the remaining 8 weeks on the experiment.

The effect of hyperthyroidism upon the metabolism of vitamin C, R. A. Lewis (*Bul. Johns Hopkins Hosp., 63 (1938), No. 1, pp. 31–40, figs. 6*).—A study of the vitamin C excretion of five hyperthyroid patients on a constant diet before and after subtotal thyroidectomy is reported, with the conclusion that the urinary excretion of vitamin C is greatly reduced in hyperthyroidism even when the intake is very high. In all but one of the patients excretion before thyroidectomy was in the range observed in scurvy, and following the operation the excretion rose in all patients, reaching normal values in all but one case.

Relation of vitamin D and mineral deficiencies to dental caries, G. F. Taylor and C. D. M. Day (*Brit. Med. Jour., No. 4087 (1939), pp. 919–921*).—Examination of the teeth of 10 children with severe clinical rickets, radiologically confirmed, in the Kangra District of the Punjab of India showed a very low incidence of dental caries and of gross hypoplasia. The teeth and jaws were well formed. The diets of the children were definitely deficient in minerals and vitamin D, consisting largely of carbohydrates with relatively small portions of proteins and fat. Meats and fruit were almost entirely absent, and milk and vegetables were consumed in very small quantities. Sugar was rarely eaten, the carbohydrates consisting chiefly of rice and chapatti, made from unmilled wheat ground in the home. The low incidence of caries together with the physical

nature of the food is thought to lend support to the detergent diet theory of caries prevention.

Present status of dental caries in relation to nutrition, N. SIMMONDS (*Amer. Jour. Pub. Health, 28 (1938), No. 12, pp. 1381–1387*).—This discussion and interpretation of the present somewhat conflicting views as to the etiology of dental caries emphasizes the relation of sweet foods to this condition. Two practical suggestions for the prevention of dental caries are given as follows: "(1) If an individual is susceptible to tooth decay, he should reduce his intake of all sweet foods to a minimum. In this way he will keep the flora of his mouth low in those organisms known to be acid formers. Starches and fats should be his main energy foods. (2) In addition to keeping the intake of sweet foods low, each person should plan his diet so that all factors, including vitamin D, are present in abundance."

Possible effects of vitamin K on prothrombin and clotting time in newly-born infants, W. W. WADDELL, JR., D. GUERRY, III, W. E. BRAY, and O. R. KELLEY (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 3, pp. 432–434*).—In a preliminary note, the authors report that the oral administration of 2 cc. of a concentrate rich in vitamin K to two female infants reduced the abnormally high prothrombin time and clotting time to normal within 7 days.

Environmental temperature and 'rat acrodynia,' P. GYÖRGY (*Jour. Nutr., 16 (1938), No. 1, pp. 69–77*).—In a further investigation of the skin manifestations described in a previous report (E. S. R., 79, p. 713), the author found that rats exposed to an environment at a temperature of 40° F. developed the dermatitis symptoms of rat acrodynia earlier than did rats kept on the test diet at room temperature. The condition was prevented or cured by the administration of Peters' eluate.

Rat acrodynia and the essential fatty acids, F. W. QUACKENBUSH, B. R. PLATZ, and H. STEENBOCK. (Wis. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 2, pp. 115–126*).—The conflicting literature on the relation of certain constituents of the diet to the production and cure of dermatitis in rats is reviewed briefly, and results obtained in a series of tests with various diets and fat supplements are reported. Initial storage of the factors essential for the development of dermatitis was largely prevented by the use, during the nursing period, of a diet in which potato meal replaced the grains of the customary stock diet. The basal diet found most satisfactory for the tests consisted of purified casein 18, cerelose 78, and Wesson salt mixture 4 parts, supplemented with β-carotene 10 μg., synthetic vitamin B_1 10, riboflavin 20, and calciferol 5 μg. daily. After 4 or 5 weeks on this diet the rats developed an acute form of dermatitis with involvement chiefly of the lips, eyes, and forepaws. The animals became inactive, lost from 5 to 10 gm. in weight, and died within a few days. In animals receiving supplements of low potency, a chronic form of dermatitis developed with very extensive lesions involving the entire periphery. Ringlets of scales appeared on the tail, and the body was covered by minute adherent scales.

In order to evaluate quantitatively the potency of various curative agents a chart was prepared giving the appearance of lips, eyes, forepaws, hind paws, ears, and tail in 4 stages of dermatitis. The animals were given the supplements to be tested as soon as the lips and paws had reached stage 2 to 3, and a cure was assumed to have been effected if at the end of 21 days the lips, eyes, and ears were normal and the paws and tail free from all symptoms except a dry scaliness. A minimum curative dose was defined as one which when given daily produced cures in more than 50 percent of the animals with none failing to respond to twice the amount of the same supplements. Cures were produced with ½ drop of wheat-germ oil, corn oil, or Wesson oil; 1 drop

of commercial or purified peanut oil; 2 drops of commercial or purified linseed oil or lard; 5 drops of olive oil; 10 drops of coconut oil; and 25 drops of butterfat. No cure was effected with hydrogenated coconut oil, cod-liver oil, or halibut-liver oil. When wheat-germ oil was fractionated and tested, the entire activity was contained in the ethyl ester prepared from the soap fraction. Fractionation of the unsaturated fatty acids gave the highest potency, with the fraction separating between —50° and —75° C. One-half drop of ethyl linoleate per day cured the dermatitis completely.

Cure of microcytic hypochromic anemia in dogs with crystalline "factor I," P. F. Fouts, O. M. Helmer, and S. Lepkovsky. (Univ. Calif. et al.). (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 1, pp. 4, 5*).—In continuation of a previous study (E. S. R., 80, p. 711), the authors report that the three dogs with microcytic hypochromic anemia were cured by the addition of crystalline factor 1 (rat antidermatitis factor, vitamin B_6).

***The assay of urine in canine blacktongue by the use of Shigella paradysenteriae* (Sonne),** H. F. Fraser, N. H. Topping, and W. H. Sebrell (*Pub. Health Rpts. [U. S.], 53 (1938), No. 41, pp. 1836–1842*).—Samples of urine were collected from six dogs while (1) on the stock ration 326, (2) on the blacktongue-producing diet 123, (3) at the first appearance of symptoms of blacktongue, and (4) when the dogs were receiving the stock diet and after the blacktongue symptoms had entirely disappeared. The experimental diet was supplemented by 5 mg. of nicotinic acid per kilogram of body weight given intramuscularly to four of the dogs. The nicotinic acid content of the urine samples was determined by studying the growth of *S. paradysenteria* (Sonne N. I. H. 741), which requires the presence of nicotinic acid or related compounds.

After from 31 to 52 days on diet 123, the bacterial growth-promoting property of the urine markedly decreased. In the dogs given nicotinic acid, the bacterial growth-promoting property of the urine increased for 1 hr. following the administration and from 48 to 72 hr. later returned to the level existing when the dogs were receiving the stock diet.

Treatment of pellagra with nicotinamide, A. C. Alport, P. Ghalioungui, and G. Hanna (*Lancet [London], 1938, II, No. 26, pp. 1460–1463*).—The daily administration of 1 gm. of nicotinamide by mouth or 0.5 gm. by injection to 15 patients with pellagra and dermatitis and 2 with pellagrous stomatitis produced great improvement in the acute mucous membrane lesions and acute skin conditions, as well as in the appetite, mental condition, and general physical health of all the patients within from 2 to more than 20 days. Chronic skin lesions in friction places and chronic atrophic changes in the tongue were only slightly improved.

When 9 of the patients were given marmite for from 7 to 25 days before the nicotinamide therapy, there was either no improvement or the condition became aggravated in all but 1 case. While the 1-gm. dose of nicotinamide produced transient headache in 2 patients, the same dose of nicotinic acid caused headache, itching, and warmth of the skin in the 5 patients receiving it. During the treatment with nicotinamide, the patients were under strict dietetic observance and meat and milk were withheld.

The modern treatment of diabetes, J. R. Scott (*Bul. N. Y. Acad. Med., 2. ser., 14 (1938), No. 8, pp. 480–490, figs. 2*).—In this lecture, by the chairman of the New York Diabetes Association, the principles constituting a guide for the modern treatment of diabetes are first enumerated, and the actual management of the diabetic patient is then discussed under the headings education of the patient, diet, insulin, complications, and significances of laboratory findings. The principles of the treatment as far as diet is concerned are to main-

tain the patient at or slightly below the ideal body weight, divide the day's food allowance into three meals and three supplementary feedings, provide 1 gm. of protein per kilogram of body weight per 24 hr. for adults and from 2 to 3 gm. for rapidly growing children, provide carbohydrate somewhere in the middle range of 120-200 gm. per 24 hr., restrict fat to the least possible amount consistent with the maintenance of an ideal body weight, and add vitamin concentrates to make up for the deficiency in fat-soluble vitamins inherent in the low-fat diets.

Iodine and the incidence of goiter, J. F. McClendon (*Minneapolis: Univ. Minn. Press; London: Oxford Univ. Press, [1939], pp. VI+[4]+126, figs. 64*).—This exhaustive compilation, intended primarily for the use of research workers and those interested in goiter prophylaxis, deals with the distribution of iodine in soils, water, foods of animal and vegetable origin, and the human body; the geographic distribution of goiter and cretinism throughout the world; and methods for the determination of iodine. Literature references are given as footnotes, numerical data in a series of 79 tables, and miscellaneous illustrative material in numerous diagrams and maps.

Contamination of drinking glasses by streptococci, L. A. Dick. (N. Y. State Expt. Sta.). (*Jour. Bact., 37 (1939), No. 2, pp. 224, 225*).—In a brief note the author reports that *Streptococcus salivarius* was recovered from the lips of 100 individuals and from the rims of drinking glasses used by the subjects.

TEXTILES AND CLOTHING

***Manufacturing and serviceability tests on sheetings made from two* selected mill types of cotton, R. E. Rogers, M. B. Hays, and J. T. Wigington** (*U. S. Dept. Agr., Tech. Bul. 645 (1939), pp. 32, figs. 14*).—The cotton used in these tests, which represent an extension of a previously noted cooperative project of the Bureaus of Home Economics and Agricultural Economics (E. S. R., 71, p. 428), was representative of two mill types of American upland cotton ranging from Middling to Strict Middling when made into heavy sheets. The same general plan was followed as in the earlier study, but more sheets in each lot were put into service, a larger sample was taken each test period, and additional laboratory tests were performed. Cotton A, which was grown in the vicinity of Somerton, Ariz., ranged from Middling Light Spotted to Strict Middling Spotted in grade and from $^{15}/_{16}$ to 1 in. in staple length. Cotton B, which was grown in Arkansas, was classed as Middling to Strict Middling in grade and ranged from $^{31}/_{32}$ to $1^{1}/_{16}$ in. in staple length. The test cottons and a commercial mixture of 20 percent Cotton A and 80 percent Cotton B were spun, woven into heavyweight muslin sheeting, bleached, and finished under similar mechanical and moisture conditions. The sheets were put into use in a Washington hotel under the same conditions as in the earlier study. The sheets, which were tested in the unbleached state and when finished, were tested at regular intervals in 25 launderings through the two hundred and seventy-fifth laundering period. The length of service beyond this point was also noted.

The first laundering removed the largest percentage of starch. A measurable amount was found after the twenty-fifth but not after the fiftieth laundering. Wear and laundering produced a progressive tendering in all three fabrics, and the length of service did not differ markedly, being 281 periods for the sheets made from Cotton A, 276 from Cotton B, and 278 from the mixed cotton. Wear had more effect on the physical than the chemical properties of the sheeting, as shown by the fact that the physical values for

the sides of the sheets after 250 launderings were similar to those of the center after 200 launderings, while the chemical values of the sides were approximately equal to the centers after 225 launderings. The unbleached sheets made from Cotton A showed more deterioration, both physically and chemically, than the two other unbleached sheets. This was also true, in general, of the bleached sheets. However, the differences in the deterioration of the two types of cottons were considered not great enough to affect serviceability.

The **testing of yarns and fabrics**, H. P. Curtis (*London and New York: Isaac Pitman & Sons, 1938, 3. ed., pp. XIII+241, figs. 94*).—An enlarged edition of a book noted earlier (E. S. R., 66, p. 97).

HOME MANAGEMENT AND EQUIPMENT

Family income and expenditures: Pacific Region.—I, Family income, D. Monroe, M. S. Weber, and H. Hollingsworth (*U. S. Dept. Agr., Misc. Pub. 339 (1939), pp. IV+380, figs. 19*).—This report is the first of a series covering income and expenditures of small-city and village families as part of the extensive consumer purchases study conducted under the auspices of the Works Progress Administration and noted previously in the annual report of the Bureau of Home Economics (E. S. R., 80, p. 717). The report contains a foreword by L. Stanley; an introductory section describing the purpose of the study, selection of communities throughout the country, sampling procedures, number and scope of the records obtained, and a description of the Pacific small cities and villages studied; two sections dealing with the presentation of the data for small-city families and village families, respectively; and a series of appendixes giving the detailed methodology for the collection and analysis of the data, an appraisal of the families from which income data were obtained, and a glossary of terms used in all phases of the study. For both small cities and villages the material presented is classified under the characteristics of the families and their households, family income, family occupation and income, earnings of husband and wife in relation to age and occupation, type and income, living quarters, home tenure, and rentals.

Some **practical aspects of lighting kitchen work areas**, J. T. Bailey (*Illum. Engin. Soc. Trans., 33 (1938), No. 8, pp. 725-733, figs. 5*).—Several methods of lighting kitchen work areas, particularly the sink and under cabinets, are described, with diagrams of the mounting positions and constructional features of local lighting equipment, the distribution characteristics of various types of reflectors, and a typical modern kitchen showing the recommendations for general and local lighting. Surface materials and colors are discussed from the standpoint of reflection and glare.

MISCELLANEOUS

Federal legislation, rulings, and regulations affecting the State agricultural experiment stations (*U. S. Dept. Agr., Misc. Pub. 348 (1939), pp. 38*).—A revision of Miscellaneous Publication 202 (E. S. R., 72, p. 141).

Annual Report [of the New Haven Station] for the year ending October 31, 1938, W. L. Slate (*Connecticut [New Haven] Sta. Bul. 421 (1939), pp. 66*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-first Annual Report of [Kentucky Station], 1938, I, II, T. P. Cooper et al. (*Kentucky Sta. Rpt. 1938, pts. 1, pp. 63; 2, pp. [3]+408+11, figs. 67*).—Part 1 includes the report of the director, the experimental work not

previously noted being for the most part abstracted elsewhere in this issue. Part 2 contains reprints of Bulletins 378–388 and Circular 49, previously noted.

Annual report of the Massachusetts Agricultural Experiment Station, 1938, F. J. Sievers et al. (*Massachusetts Sta. Bul. 355 (1939), pp. 104, pls. 8*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. An abstract is also included on A Study of Rate of Decomposition of Haddock Muscle at Various Temperatures as Indicated by Ammonia Content, by G. C. Crooks and W. S. Ritchie (pp. 102, 103).

Forty-fifth Annual Report [of Minnesota Station], W. C. Coffey (*Minnesota Sta. Rpt. 1938, pp. 93*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual Report of [Puerto Rico College Station, 1938], J. A. B. Nolla et al. (*Puerto Rico Col. Sta. Rpt. 1938, pp. [4]+114, pl. 1, figs. 14*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

What's new in farm science: Annual report of the director, [Wisconsin Station, 1938], II, compiled by N. Clark and N. Hoveland (*Wisconsin Sta. Bul. 443 (1939), pp. 96, figs. 27*).—This supplements and completes the report previously noted (E. S. R., 81, p. 158), dealing with the subjects of garden, orchard, and cash crops; plant diseases; insect pests; soils; field crops; livestock feeding; and poultry. The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-eighth Annual Report of [Wyoming Station, 1938], J. A. Hill (*Wyoming Sta. Rpt. 1938, pp. 48*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also included.

Bimonthly Bulletin, [May 1939] (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 5, pp. 51, figs. 9*).—In addition to several articles noted elsewhere in this issue, there are included Plants of the Mustard Family in North Dakota, by O. A. Stevens (pp. 7-10); Relationship of Farm Population Movement and Drought (pp. 22-25), by D. G. Hay; and the customary abstracts.

NOTES

Arizona University and Station.—A foreman's cottage was recently completed as a part of the developmental program on a new farm, located on the Yuma Mesa, which has been set aside for the use of the university by the Federal Government.

Dr. P. S. Burgess has returned as dean of the College of Agriculture and director of the station after a year in a similar capacity at the Rhode Island College and Station. Dr. R. S. Hawkins, who has served as acting dean and acting director, has been appointed vice dean and vice director in addition to reassuming his position as head of the agronomy department. C. W. Van Horn returned September 1 as assistant horticulturist after a year's graduate study at the University of Maryland. Dr. H. G. Johnston, associate professor of entomology in the Texas College, has been appointed entomologist, beginning July 15 and dividing his time equally between the station and the extension service. Fred Gremmel, assistant professor of animal husbandry and assistant animal husbandman, resigned August 8 to become associated with the U. S. D. A. Soil Conservation Service in Texas.

Connecticut State Station.—The General Assembly of Connecticut increased the station's maintenance appropriation for the biennium beginning July 1, 1939, by $35,000 per year. This is a restoration of reductions voluntarily made by the station in 1933. The Assembly also appropriated $15,000 for new greenhouses.

A new laboratory and service building, including an assembly room and garage, is being erected on the station grounds. A new laboratory is also under construction at the Tobacco Substation.

Dr. O. E. Street, plant physiologist at the Tobacco Substation, has resigned to become agronomist in charge of the Federal tobacco station in Lancaster County, Pa., beginning August 15. Dr. Raimon Beard has been appointed assistant entomologist.

Florida University.—Plans are being made for an Inter-American Educational and Cultural Conference to be held at the university in April 1940 under a special grant from the Carnegie Endowment for International Peace. Sections will be organized in history and geography, literature, music and drama, art and architecture, economic and social problems, Government and public administration, and education. Participation by representatives of Latin American countries will be emphasized.

Illinois University and Station.—Dr. William E. Carroll, chief of swine husbandry, has been appointed head of the department of animal husbandry.

Kansas College and Station.—The first of several industrial fellowships for research in chemurgy (the industrial utilization of farm products) is announced. This fellowship is to undertake a study of the economic feasibility in Kansas of the manufacture of starch from Irish potatoes, sweetpotatoes, and other farm products. It is pointed out that although the 1928–32 State average production of potatoes was 2½ million bushels with a market value of $1,500,000,

production has declined 50 percent because of poor market outlets and other factors.

Drs. O. A. Shaw, instructor and assistant in dairy husbandry in the Idaho University and Station, and H. E. Bechtel have accepted positions in the department of dairy husbandry. Dr. Katherine Roy has been appointed head of the department of child welfare and euthenics.

Kentucky Station.—R. K. Calfee has resigned as assistant chemist.

Maine University.—Gordon M. Cairns has been appointed head of the department of animal industry vice L. S. Corbett, who will give his entire attention to the deanship of men.

Mississippi College and Station.—Henry H. Leveck, associate professor of animal husbandry and associate animal husbandman, has been appointed head of the department vice Dr. E. W. Sheets, resigned. A. E. Cullison, assistant in animal husbandry in the Illinois University and Station, has been added to the animal husbandry department.

New Jersey Stations.—Construction is nearing completion on a turkey research substation authorized by the 1938 legislature. This station is located at Millville, Cumberland County, on an 18-acre tract which also includes the pigeon breeding contest. The county is building a five-room headquarters building 24 by 30 ft., two stories high, with an office, incubator room, killing room, feed room, and a room for meetings. The plant will include six colony brooder houses 10 by 12 ft. with 20-ft. wire sun porches, two 10 by 12 breeder units, and six summer shelters. Dedication will take place October 12 in conjunction with the annual New Jersey Turkey Field Day and work will start November 1, with an assistant poultry husbandman in charge. About 300 turkeys will be reared the first year. The program embraces feeding studies and breeding of a broad-breasted small turkey for family consumption. Possibilities of smoking and quick freezing will also be explored.

About 35 executives of press and radio from New York, New Jersey, and Philadelphia were guests of the station August 14, witnessing demonstrations of research in several departments.

Recent appointments include Charles A. Thompson as State leader of county agents vice Edwin A. Gaunt, resigned, and Van Wie Ingham, formerly executive secretary of the State soil conservation committee, as assistant to the dean of the college of agriculture and director of the stations.

New York State Station.—Dr. G. L. McNew of the Rockefeller Institute has been appointed chief of research (plant pathology). Dolores Weimer, assistant in seed investigations, has resigned to engage in commercial work.

Ohio Station.—Recent appointments include Dr. Arthur R. Mangus as associate in rural economics and E. Wise Burroughs and Irvin W. Wander as assistants in animal industry and horticulture, respectively.

Oklahoma College and Station.—Harry W. Cave, professor of dairy husbandry in the Kansas College and Station, has been appointed in charge of the dairy department after September 1. Dr. Frank B. Cross, acting head of the department of horticulture, has been given permanent charge of that department.

Rhode Island College and Station.—Dr. Cooper Curtice, associated with the zoological and animal husbandry work from 1900 to 1907 and who retired as veterinarian in the U. S. D. A. Bureau of Animal Industry in 1930, died August 8 aged 83 yr. A native of Connecticut, Dr. Curtice was graduated from Cornell University in 1881 and received the D. V. S. degree from Columbian Veterinary College in 1883 and the M. D. degree from the National Medical College in 1888. He served with the U. S. Department of Agriculture from

1886–92, 1895–97, and 1907–30 and was also veterinarian with the New York State Board of Health, 1893–94 and 1897–98, and with the North Carolina College and State Board of Agriculture from 1899 to 1900. He worked on a considerable variety of problems, including intestinal parasites of sheep, blackhead and other diseases of turkeys, the incubation and rearing of poultry, and fowl and goose septicemia, but was probably most widely known for his extensive contributions to the eradication of cattle ticks and tick fever.

Texas College and Station.—Dr. H. H. Harrington, president from 1905 to 1907, director of the station from 1906 to 1911, and associated with the chemical work of the institution from 1888 to 1906, died August 16, aged 79 years. He was a graduate of the Mississippi College and served there as assistant chemist from 1882 to 1888.

Dr. D. W. Thorne, associate professor of agronomy, has resigned to become associate professor of soils and associate agronomist in the Utah College and Station.

Vermont Station.—The main dairy barn on the University Farm burned at noon on August 22, the cause being spontaneous combustion in a large mass of chopped hay. Director Hills writes that "no animals were lost. Indeed, animals were gained in that a calf was born during the fire in the basement of the barn. The fact that the buildings were covered with asbestos cement shingles, together with the excellent work of the city fire department, enabled the saving of all the rest of the buildings."

Office of Experiment Stations.—John I. Schulte, associated with the Office since 1897 in various capacities, has retired as of November 1, 1939. A native of Iowa and a graduate of the Iowa College in 1895, he remained there as assistant in horticulture for the ensuing 2 years. His early service in the U. S. Department of Agriculture was as specialist in field crops on *Experiment Station Record*. He continued to have charge of this work during most of the next 20 years and also did some abstracting in animal husbandry, dairying, and in other lines. More recently he has been associated mainly with the administrative work of the Office in its relations with the State experiment stations, notably in the assembling of records and statistics, the interpretation of laws and rulings, and many miscellaneous matters. One special activity was his assembling and installation of Department and experiment station exhibits at several world's expositions in this country and abroad, and another his service as interpreter and guide to a number of distinguished delegations of visitors from foreign institutions seeking a knowledge of American agriculture. In 1900 he was a member of the international jury of awards at the Paris Exposition and received in connection with this service the designation from the French Government of Chevalier du Mérite Agricole. His broad knowledge of agricultural science and institutions, his proficiency in foreign languages, his versatility and adaptability, and his sound judgment and dependability made him of unique value in the Office organization and his retirement a real loss in many directions.

Dr. Georgian Adams, associate home economics specialist in the Bureau of Home Economics, has been appointed associate home economist vice Mabel Dickson Dill, resigned, and has entered upon her duties.

New Journals.—*Dairy Science Abstracts* is being published by the Imperial Bureau of Dairy Science at Shinfield, Reading, England. The initial number contains about 500 abstracts classified under the headings of husbandry, technology, control and standards, economics, physiology, bacteriology and mycology, chemistry and physics, and miscellaneous.

A merger of the Central Society of Veterinary Medicine and the Japanese Society of Veterinary Science under the latter title has resulted in the discon-

tinuance of their former journals and the establishment of *The Japanese Journal of Veterinary Science*. Among the articles in the initial number is one in English by J. Nakamura entitled Complement-Fixation Reaction in Rinderpest—V, Distribution of Antigen in the Body of the Infected Calf.

An Industrial and News Edition of the Journal of the Indian Chemical Society is being published under the joint auspices of the Indian Chemical Society and the Institution of Chemists (India) at 92 Upper Circular Road, Calcutta. The initial number contains among other material an address entitled Mineral Elements in Nutrition, by U. P. Basu.

Archiv für die gesamte Virusforschung is being published from time to time by Julius Springer, Wien (Vienna), under the supervision of a board from various countries, including R. E. Shope and W. M. Stanley of Princeton. The initial number contains 12 original articles in English, French, or German on plant and animal virus problems.

The Journal of Endocrinology is being published at the Courtauld Institute of Biochemistry, Middlesex Hospital, London, W. 1. The initial number contains 11 original articles.

Miscellaneous.—Dr. William W. Skinner has been appointed associate chief of the U. S. D. A. Bureau of Agricultural Chemistry and Engineering. In association with the chief of the bureau he will assist in the supervision and direction of all scientific, technical engineering, and administrative work, including the four regional research laboratories.

Dr. Walter C. Lowdermilk, chief of the division of research of the U. S. D. A. Soil Conservation Service, has been investigating soil conservation in Palestine on the request of that government, spending several weeks in observations which have extended into Negeb and to the Aqaba area of Transjordan.

Dr. Franklin S. Harris, president of Brigham Young University and previously director of the Utah Station, has been given leave of absence to reorganize the department of agriculture of Iran and to plan for the rehabilitation of the agriculture of that country.

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THE THIRD INTERNATIONAL CONGRESS FOR MICROBIOLOGY

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The International Congress for Microbiology, the third session of which was held in New York City from September 2 to 9, 1939, is not as youthful an institution as might be inferred from a total of only three meetings. Actually, the organization is an outgrowth of an older institution, The International Congress of Hygiene and Demography, which was discontinued after its fifteenth meeting in Washington, D. C., in 1912, as a result of the World War and its aftermath. According to the constitution adopted for the present "International Association of Microbiologists" at its first meeting (Paris, 1930), its object is "to promote scientific thought by creating a closer relationship between the workers in the different countries, and especially to spread the idea that all its members should be united in a common ideal of peace and constant friendship." At no period since its original inception have these sentiments been more timely.

Many of the 400 or more foreign scientists who had planned to attend the Congress remained at home because of the imminence of war. Nevertheless, the total registration was 1,591, and in spite of the tragic political situations in Europe and elsewhere 150 members were registered and present from over 30 lands outside the United States. The British Isles led with 52, followed by Canada with 20, Norway and Sweden with 10, Belgium with 7, France with 5, Cuba, Denmark, Japan, and Switzerland with 4 each, and Hawaii, Hungary, Germany, and Palestine with 3 each. South American countries, including Brazil, Argentina, and Uruguay, were represented by 12, and there were 1 or 2 delegates each from such far-flung quarters of the earth as Africa, Australia, Ceylon, China, Finland, Mexico, The Netherlands, Poland, Rumania, and Turkey.

Many representatives of the State experiment stations and of the United States Department of Agriculture contributed important papers to the program. The large volume of proceedings will contain much that represents fundamental advances in the study of micro-

organisms which cannot fail to prove of basic value in connection with agricultural progress.

The welcoming address to members of the Congress and their friends at the opening meeting and reception was given by Dr. Thomas M. Rivers, director of the Rockefeller Institute and president of the Congress. He referred to the modern microbiologists as equaling and in some cases surpassing the achievements in the "Golden Age of microbiology." "True," he said, "we stand on the shoulders of those who preceded us and we should respect their accomplishments . . ., but if the abstracts of 600 communications on this program can be considered as indicative of the character of work now in progress it is obvious that these workers are true sons and daughters of the nineteenth century microbiologists." Among the high lights of recent microbiological research which he touched upon were the unprecedented advances in chemotherapy, bacteriotherapy, and immunotherapy, the striking regularity with which new viruses are being discovered, the isolation of virus proteins in both the plant and animal fields, with the consequent revolutionary changes in our ideas of nature, the fashioning of a bridle to yellow fever, and the delving into the secrets of the physiology and nutrition of the bacteria themselves, which "without doubt will aid investigators interested in the higher forms of life."

Mayor LaGuardia of New York and Dr. John L. Rice, Commissioner of Health, proffered the welcome of the city and the Health Department to the Congress. Sir John C. G. Ledingham, director of the Lister Institute and president of the Second Congress (London, 1936), expressed the appreciation of the foreign members to the Executive Committee which had so efficiently planned this Congress. He asserted that in the field of microbiology "you in the United States have been greatly blessed by the bountiful support given by private benefactors, and we foreign delegates from many countries have ample reason to be grateful. . . . Your Federal Government also has not been behindhand in voting public funds for numerous scientific objects in which microbiology has a part to play. . . . It is abundantly clear that in its support of those spheres of science which this Congress takes under its purview, the United States presents a noble example to the world." Dr. Lewis R. Jones, emeritus professor, University of Wisconsin, representing the field of plant science, stressed the significance and unity of the various lines of microbiological work, the timeliness of research in this field, and the deeper significance in the progress as a whole than for that of any of its parts. One hundred years ago biology was started on a microbiological basis. The stabilizing influence of the cell theory has guided the physiologist and cytologist and furthered evolutionary

thought. Referring to fungus, bacterial, and virus diseases in plants, Dr. Jones stated further that there has been a steadily increasing correlation of plant pathology and biological research as a whole with animal pathology. Work with plant virus problems already offers much promise concerning the intimate relations of virus and host tissues, but even more significant are the definitions of basic questions as to the character or nature of the virus itself. "What in the realm of microbiology," he added, "is more challenging than this!"

At the official banquet, high tribute was paid by Dr. E. G. D. Murray, professor of bacteriology and immunity at McGill University, to Dr. Theobald Smith, "Father of American Bacteriology," in whose memory the Congress had struck off a bronze medal for its members. Dr. Karl F. Meyer, director of the Hooper Foundation of the University of California, gave a toast to the foreign members of the Congress and their guests, and in concluding said, "I give you the sacred bonds of science which go beyond all bonds of nationality or creed." In reply, Prof. S. Orla-Jensen of the Royal Technical College, Copenhagen, transmitted the cordial invitation of the Danish Government for the Fourth Congress to meet in Copenhagen in 1942, and expressed his personal satisfaction that it had already been accepted. Dr. Joseph W. Bigger of Dublin, Prof. Estenio Hormaeche of Montevideo, Dr. N. H. Swellengrebel of Amsterdam, Prof. André Gratia of Liege, Prof. Ch. Oberling of Strasbourg, and Sir John Ledingham also spoke.

Besides the three general scientific meetings open to the public, the official sessions were scheduled under nine subject sections, which in some cases were subdivided further. For example, in agricultural and industrial microbiology the programs were grouped under soil microbiology, foodstuffs and spoilage, dairy bacteriology, bacteriology of water and sewage, and fermentations. The nine main sections dealt, respectively, with variation and taxonomy, microbiological chemistry and physiology, viruses and viral diseases, rickettsiae and rickettsial diseases, protozoology and parasitology, fungi and fungus diseases, medical and veterinary bacteriology, agricultural and industrial microbiology, and immunology. Furthermore, and preceding the Congress proper, three symposia dealing with different phases of soil microbiology formed the subjects of meetings of the Third Commission of the International Society of Soil Science on August 30–31 at New Brunswick, N. J.

From a program in which some 600 papers were originally scheduled to appear it would be difficult if not impossible to single out one or even a few as exhibiting the outstanding contributions of the Congress. Particularly notable, however, were the advances shown in

the study of viruses. Furthermore, the value of the cinema both for research and for demonstration and educational purposes was well exemplified by motion pictures depicting the life history of bacteria as shown by Dr. Morton C. Kahn of the Cornell University Medical School.

One of the most encouraging general impressions from these sessions was the appearance on many of the same programs of investigators working in both the plant and animal fields, coupled with the very evident mutual respect and with recognition of the reciprocal scientific values of methods and findings in the two fields as brought out both in the papers given and in the discussions which followed. Thus in a single session dealing with variation and taxonomy in special groups of bacteria there were papers on such diverse matters as the relationships of phytopathogenic bacteria, and of the cholera vibrio; filtrable forms of a bacterial parasite of fish; the taxonomy of lactic acid bacteria, streptococci, the proteus group, and mesophilic bacteria; the classification of gram-negative, nonsporiferous anaerobes; and degeneration and variation of gonococci. Similarly, and side by side on various other programs, there were papers on the nomenclature and classification of phytopathogenic viruses, and on the properties of the virus of vaccinia; comparative studies on ultracentrifugation and serological reactions of bacteriophages, plant viruses and insect viruses, and the use of the centrifuge in the study of the yellow fever virus; the control of the bulb or stem nematode. and the occurrence of Trichinae in swine; the nature of the growth-stimulating factors for *Rhizobium trifolii*, the synthesis of tryptophane by typhoid bacilli, and growth factors for trichomonads; the fruiting phases of anthracnose fungi in plants, and actinomycosis among cattle and swine; and the control of loose smut of barley, mycorhizal responses to experimental soil variations, and the biological treatment of dermatomycosis. One of the most interesting sessions was made up of a symposium on host-parasite relationships in which three men from the plant side and three from the animal side spoke, respectively, on etiology and pathogenesis, tissue reactions, and natural resistance, including immunity.

Further evidence auguring well for the future progress of science was also forcefully brought out not alone in the increasing intensification of subject specialization and in the continuous advances in refinement of methods and technics, but in such developments as these viewed in connection with a growing sense of the essential oneness of all biological research which is drawing together many superficially unrelated interests in united international efforts toward common ends. It is to be hoped that this example will not be entirely lost on the world of today.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations of the Indiana Station]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1938, pp. 8–10, 12, 13, 74, 75, fig. 1*).—These have included work on chemical studies on pure lines of corn, by D. M. Doty; analyses of commercial soybean oils and drying rates when mixed with 10 percent tung oil, by H. R. Kraybill, A. W. Kleinsmith, and M. H. Thornton, nonfat constituents of soybean oil, by Thornton and Kraybill; carbohydrates of the soybean, by E. D. Walter and Kraybill; photoelectric photometer, by F. P. Zscheile, C. L. Shrewsbury, and Kraybill; carotenoid pigments, by Zscheile and J. W. White; and mint oil, by F. C. Gaylord and K. I. Fawcett.

Oxidation-reduction potentials and pH values in soils, V. M. CONWAY (*Chron. Bot., 5 (1939), No. 2–3, pp. 167, 168*).—A review with citations.

A preliminary report on a simple and rapid method for determining the moisture content of dates, G. L. RYGG. (U. S. D. A.). (*Date Growers' Inst. Rpt., 15 (1938), pp. 4, 5*).—The use of a refractometer for quickly determining the moisture content of date fruits is discussed. In no case did the refractometer readings differ from those obtained by the toluene method by more than about 1 percent.

The semi-quantitative estimation of mineral oil in the shells of processed eggs, S. R. HOOVER. (U. S. D. A.). (*U. S. Egg and Poultry Mag., 45 (1939), No. 3, pp. 162, 163, 188*).—The simple method described for the rapid estimation of the oil contents of the shells of processed eggs essentially consists in measuring the turbidity produced when the shell is boiled with alcoholic sodium hydroxide and then diluted with water. Application of this method revealed a wide variation in the oil content of individual processed eggs, suggesting that this condition may account for some inconsistent results of processing encountered in commercial practice.

Colorimetric methods for the quantitative estimation of indole-3-acetic acid, J. W. MITCHELL and B. C. BRUNSTETTER. (U. S. D. A.). (*Bot. Gaz., 100 (1939), No. 4, pp. 802–816, figs. 3*).—The methods for measuring indoleacetic acid in water solution included its reaction with (1) KNO_2 and HNO_3, (2) $FeCl_3$ and H_2SO_4, and (3) $FeCl_3$ and HCl. The nitrite and $FeCl_3$–H_2SO_4 tests were studied in detail to determine the effect of the different factors involved on the intensity and stability of the color produced. The nitrite test proved applicable for determining indoleacetic acid in aqueous solutions at concentrations of 0.01–0.15 mg. per cubic centimeter, while the $FeCl_3$–H_2SO_4 test proved suitable for estimating total amounts of 0.02–0.1 mg., under the test conditions. The latter test was sensitive to essentially the same concentration range as the nitrite test, but was less suitable since the color produced was not stable. There are 10 references.

The quantitative determination of vitamin B_1 [trans. title], A. ST. v. MALLINCKRODT-HAUPT (*Klin. Wchnschr., 18 (1939), No. 13, pp. 467, 468, fig. 1*).—A new photometric method for the determination of vitamin B_1, making use of the thiochrome reaction, with the measurement of the fluorescence in a Pulfrich photometer, is described. By changing the blue fluorescence to green through

the addition of acetic acid to the isobutyl alcohol (2 cc. of acetic acid to 4 cc. of the alcohol) and using a red filter, the test is made sufficiently sensitive to detect as small an amount of the vitamin as 2γ (1 I. U.) per cubic centimeter of the isobutyl alcohol. Beyond a total content of 0.15 mg. or 75 I. U. of the vitamin the test is no longer satisfactory. Parallel tests with solutions containing known amounts of the vitamin and with fuller's earth adsorbates of the same solutions indicated that the loss of the vitamin through adsorption and subsequent elution is very small. The method has been found satisfactory for use with cultures of yeast and bacteria and with a number of samples of urine.

The vitamin C content of human urine and its determination through the 2,4-dinitrophenylhydrazine derivative of dehydroascorbic acid, J. H. ROE and J. M. HALL (*Jour. Biol. Chem., 128 (1939), No. 1, pp. 329–337*).—The furfural method for determining ascorbic acid previously described (E. S. R., 77, p. 584) has been applied in comparison with indophenol titration to the urines from 50 normal human subjects. The values are tabulated as ascorbic acid content per liter of urine in place of the usual 24-hr. sample, with no indication as to time of day on which the samples were taken. The urine from 14 of the subjects who were apparently on a good diet showed no vitamin C by the furfural method, and the indophenol titration gave values ranging from 0 to 297 percent higher than those by the furfural method.

AGRICULTURAL METEOROLOGY

A meteorological service of the future, W. C. DEVEREAUX. (U. S. D. A.). (*Bul. Amer. Met. Soc., 20 (1939), No. 5, pp. 212–221*).—During 1938 the late W. R. Gregg addressed letters to many meteorologists requesting an outline of what a meteorological service 50 yr. from now will be like. This paper consists of extracts from the replies, with comments by the author.

***Sensitive open-scale instruments for the detection of minor disturbances* of the atmosphere,** S. P. FERGUSSON (*Bul. Amer. Met. Soc., 20 (1939), No. 4, pp. 135–141, figs. 3*).—The author describes and discusses the operation of barographs, thermographs, hygrographs, anemographs, and nephoscopes in successful use.

Some observed effects of certain atmospheric variations, A. V. LOTT (*Ind. Acad. Sci. Proc., 53 (1937), pp. 176–188, figs. 5*).—The author concludes from this study that all major weather changes in the United States, and possibly throughout the world, seem to be due to changes in the form and position of the world pressure areas, which in turn appear to be due to variations in the velocity of the general circulation. The longitudinal movement of the air, eastward in temperate latitudes, may not be a permanent feature of a planetary wind system. It may be replaced by a latitudinal movement from some southerly or northerly direction. Temperature does not appear to affect the circulation in just the way generally believed, but the circulation has decided effects on the temperature. A more complete knowledge of the variations in the velocity of the general circulation may be of decided advantage in forecasting future weather trends.

The variations of the solar constant and their relation to weather: Reply to Paranjpe and Brunt, C. G. ABBOT (*Quart. Jour. Roy. Met. Soc. [London], 65 (1939), No. 280, pp. 215–236, figs. 2*).—"The author cites five recent papers containing many evidences of solar change ignored by critics. Chief among them, and in the author's opinion unanswerable, are evidences that day-to-day solar changes profoundly influence temperatures." These relationships are discussed in detail in reply to published criticisms.[1]

[1] Quart. Jour. Roy. Met. Soc. [London], 64 (1938), No. 276, pp. 459–476.

The variation of solar ultra-violet radiation during the sunspot cycle, E. V. APPLETON and R. NAISMITH (*Phil. Mag. and Jour. Sci., 7. ser., 27 (1939), No. 181, pp. 144–148, fig. 1*).—"Measurements of upper-atmospheric ionization by the critical frequency method show that the solar ionizing agent (ultraviolet light) responsible for the formation of regions E and F_1 of the ionosphere varies by 120 to 150 percent during the sunspot cycle. The ionization and electrical conductivities of these regions vary correspondingly by 50 to 60 percent."

Fluctuations of ultraviolet solar radiation [trans. title], G. R. MICZAIKA (*Ztschr. Astrophys., 18 (1939), No. 2, pp. 151–154, fig. 1*).—The author concludes that the annual fluctuations of ultraviolet solar radiation are insufficient to explain the observed fluctuations in intensity. The theory is adduced that changes in the atmospheric pressure and humidity are responsible for the differences in the intensity.

Studies of the temperature changes conditioned by radiation in the upper troposphere in anticyclone regions [trans. title], F. KORTÜM (*Gerlands Beitr. Geophysik, 54 (1939), No. 2, pp. 148–167, figs. 15*).—The author discusses the problems of temperature in relation to subtropical and polar air masses of the upper troposphere in their advection to other latitudes, explaining these phenomena through an adjustment to the conditions of the new surroundings by radiative processes. For the subtropical air masses this involves an increase and for the polar masses a decrease in cooling by radiation. The assimilation is said to occur in such a manner as to gain significance relative to the heat content of the anticyclone.

An investigation of the lapse rate of temperature in the lowest hundred metres of the atmosphere, N. K. JOHNSON and G. S. P. HEYWOOD (*[Gt. Brit.] Met. Off., Geophys. Mem. 77 (1938), pp. 50, pls. 12, figs. 6*).—This monograph describes the instrumental equipment employed, gives a detailed analysis of the records obtained during a 5-yr. period, and shows the steps taken to determine the characteristics and possible sources of error in the more important of the instruments. The results obtained by analysis of the records are set out in detail. Comparison of lapse rates at two stations led to the conclusion that both the topographical and the conductivity effects operate to produce similar results, but the meteorological observations did not permit a decision as to how much of the observed difference was due to each of these causes. The following are also discussed, with formulas and tabulations: Atmospheric turbulence calculated from the temperature curves, effect of wind velocity on the lapse rate and turbulence, short period temperature variations, extreme values of the lapse rate, rate of growth of nocturnal inversions, radiation temperature structure, and radiation fog.

A new temperature chart, J. J. GEORGE and R. D. ELLIOTT (*Bul. Amer. Met. Soc., 20 (1939), No. 3, pp. 105–117, figs. 12*).—The thermal chart described is said to have been of material assistance in map analysis, third dimension picturization, forecasting winds aloft under adverse conditions, and as an aid in identifying the trajectories of air masses. The shortcomings of the method have to do with the computing of winds aloft and the failure to take account of moisture distribution. The physical principles, detailed formulas, and methods of construction involved are taken up in detail.

The land and sea breeze of Door Peninsula, Wisconsin, E. R. MILLER (U. S. D. A.) (*Bul. Amer. Met. Soc., 20 (1939), No. 5, pp. 209–211*).—In seeking the explanation of the rainfall, temperature range, and length of growing season in the Upper Peninsula of Michigan and the adjacent part of Wisconsin, the conclusion from the observations recorded here is that the lake breeze penetrates only about a mile inland during the heat of the day when the temperature gradi-

ent is steepest. Hence the phenomena of lake influence described as extending 60 miles inland, on the basis of climatic charts, must be ascribed to the movement and mixing of lake air by cyclonic and possibly by monsoonal winds.

What happens to the rain? B. A. KEEN (*Quart. Jour. Roy. Met. Soc.* [*London*], *65* (*1939*), *No. 280, pp. 123–137, figs. 4*).—An address summarized as follows: "An annual rainfall of 30 in. means that 3,000 tons of water fall on an acre of land. In the course of the year this all disappears, by run-off, evaporation, transpiration through vegetation, and by downward percolation. The relative importance of these factors in British and overseas conditions is discussed. Many of the traditional beliefs among farmers and gardeners were based on a theory of water movement that was attractively simple to understand—but incorrect. It is only in recent years that the true picture of the movement of water in the soil has been built up. In consequence, some of the traditional practices need revision, while others now have a different explanation. The new work has also clarified some of the concepts used in hydrology."

The artificial dissipation of fog, D. BRUNT (*Jour. Sci. Instruments, 16* (*1939*), *No. 5, pp. 137–140*).—The author discusses the formation of and the physical conditions in fog, and outlines two methods of dissipating it, viz, the chemical method which aims at destroying the equilibrium between the fog particles and the medium in which they are suspended, and the method of heating the fog until all the water drops evaporate—the latter deemed the more feasible of the two.

Factors influencing tree destruction during the New England hurricane, S. W. BROMLEY (*Science, 90* (*1939*), *No. 2323, pp. 15, 16*).—In comparing five hurricanes in the Southern States with the September 1938 hurricane in New England, the author cites six factors believed to be paramount in explaining the greater susceptibility of the northern trees to the gale, viz, extremely high wind velocities in local areas, types of trees prevalent, tree ages, man-made conditions, insect and fungus injuries to the trees, and soil conditions. The need for planting of sturdy varieties and proper care of the trees are points that are stressed.

Climatic conditions and suggested cropping systems for northwestern Oklahoma, H. A. DANIEL and H. H. FINNELL (*Oklahoma Sta. Cir. 83* (*1939*), *pp. 26, figs. 9*).—An effort is made to outline a system of farming adapted to the climatic conditions of this area. From a summary of previous studies (45 references), it appears that available moisture rather than plant foods is the limiting factor in crop production here, and practices tending to conserve moisture and to adapt the cropping system to the moisture available are discussed. Rotations in dry-land farming should be aimed at using crops adapted to the available soil moisture in a particular season and maintaining a vegetative cover to prevent wind erosion, the effect of the crop on soil fertility being a secondary consideration. Wheat, for cash income, must be planted as often as conditions promise a successful crop, and rainfall data and the amount of raw crop residues in the soil can apparently be used to give a fairly dependable forecast. The system suggested is based on the substitution for wheat of some crop giving more promise of success in years when wheat does not have a favorable prospect. To make use of the sorghum forage produced in such years, the keeping of some livestock is recommended. Appendixes present the data on rainfall, evaporation, and wheat yields on which the proposed cropping system is based.

Local climate and the growth of trees with special reference to frost, W. R. DAY (*Quart. Jour. Roy. Met. Soc.* [*London*], *65* (*1939*), *No. 280, pp. 195–209, pls. 3, figs. 2*).—Forest types are said to be determined largely by the general climate, but local conditions exercise considerable influence. The natural forest

in Great Britain is composed of some species relatively hardy to frost and others comparatively easily injured by it. The latter species usually form the final woodland, and their successful growth is made possible by the development of favorable conditions of climate and soil within woodland first formed by hardy species. Examples illustrate the effect of overhead and side shelter on the temperature of the air over the ground, and the influence of topography on frost is also illustrated and discussed. The effects of accessory factors, such as soil fertility, local warm or cold situations, and the general suitability of the exotic species to the climate in which they are introduced, are also discussed in relation to frost injury.

The influence of vegetation on climate in West Africa, with particular reference to the protective aspects of forestry in the Gold Coast, H. W. Moor (*Univ. Oxford. Imp. Forestry Inst., Inst. Paper 17 (1939), pp. 15*).—This is a critical review (65 references).

SOILS—FERTILIZERS

[**Soil work of the Hawaii Station**] (*Hawaii Sta. Rpt. 1938, pp. 47–53, fig. 1*).—Reports on soil nitrogen studies and the carbide method for determining soil moisture, both by E. T. Fukunaga and L. A. Dean; soil phosphorus studies, by Dean; the calcium: magnesium ratio of some Hawaiian soils and quick soil testing, both by C. Lyman and Dean; temperature as a factor in surface-energy relationships; heat of wetting as related to soil-moisture content; and the rate of temperature change in soils are presented.

[**Soil investigations at the Idaho Station**]. (Partly coop. U. S. D. A. et al.). (*Idaho Sta. Bul. 229 (1939), pp. 16, 17, 27, 36*).—Use of borax to relieve alfalfa yellows, comparison of various phosphates, and work on "slick spot" soils are briefly dealt with.

[**Soil investigations of the Indiana Station**] (*Indiana Sta. Rpt. 1938, pp. 8, 20, 29, 30, 89, fig. 1*).—This report contains notes on acid and base-forming quality of fertilizers, by L. E. Horat; soil conservation, by I. D. Mayer; rapid soil tests indicating widespread fertility deficiencies, by S. F. Thornton, R. A. Weaver, and O. Cudworth; greenhouse pot tests showing relative efficiencies of different phosphates and the relative availability of magnesium compounds, both by Thornton and M. Drake; evidences of the increasing need for available potash on gray flats, by G. P. Walker; seasonal variations in the available phosphate and potash content of soils as measured by the Neubauer and Purdue rapid soil test methods, by Thornton, A. J. Ohlrogge, and S. Alfred; and comparison of different phosphates at the Moses Fell Annex Farm, Bedford.

[**Soil work of the Louisiana Rice Station**] (*Louisiana Sta., Rice Sta. Bien. Rpt. 1937–38, pp. 20–23*).—Chemical characteristics of soils in the rice area and cylinder experiments at Baton Rouge are discussed by J. F. Reed and M. B. Sturgis; soil fertility studies in the Lake Charles area, by W. J. Peevy and Sturgis; arsenic toxicity to rice, by Sturgis and E. A. Epps; and sulfofication in soils, by Sturgis and M. Stelly.

[**Soil investigations of the Nebraska Station**] (*Nebraska Sta. Rpt. [1938], pp. 13–19, 52*).—The report notes work on methods for the estimation of soil organic matter; commercial fertilizers, manure, and lime; revegetation of abandoned land; studies on the solubility of soil phosphorus; factors affecting permeability of soils to water; relationships between slope, depth of topsoil, and productivity; soil erosion control and soil moisture conservation (coop. U. S. D. A.); and water level investigations.

[**Soil Survey Reports, 1933 and 1934 Series**] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1933, Nos. 23, pp. 43, figs. 2, map 1;*

24, pp. 44, pls. 3, figs. 2, map 1; 1934, No. 9, pp. 52, pl. 1, figs. 3, map 1).—Except as indicated below, these surveys were made in cooperation with the respective State experiment stations: 1933, Nos. 23, Alfalfa County, Okla., A. W. Goke et al., and 24, Decatur County, Ga., A. H. Hasty et al. (Univ. Ga.), and 1934, No. 9, Kent and Washington Counties, R. I., R. C. Roberts et al.

The soil characteristics of Connecticut land types, M. F. Morgan (*Connecticut [New Haven] Sta. Bul. 423 (1939), pp. 64, pls. 35, figs. 16*).—This bulletin supersedes part 1 of Bulletin 320 (E. S. R., 64, p. 206).

Excellent airplane photographs have now provided facilities for more rapid and accurate delineation of soils as components of land types. Federal funds have contributed to the preparation of land type and land use maps of the State in some detail. Continued investigations of the chemical and physical factors of soil fertility of various soil types under prevailing agricultural uses have greatly expanded knowledge of the Connecticut soils. The development of rapid methods of chemical soil testing has provided for a wider application of such information. Forest soil studies have given a more complete picture of the chief features of soil profile development under natural conditions.

Horizon variations of three New Hampshire Podzol profiles, W. H. Lyford, Jr. (N. H. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 242-246, figs. 2; also New Hampshire Sta. Sci. Contrib. 68 [1939], pp. 242-246, figs. 2*).—The author points out that although "variations in thickness of the ash-gray A_2 horizon of Podzols may well be shown by means of photographs . . . the variations in position and thickness of the various B horizons may not be as easily shown." In the author's new technic of profile drawing "a string was stretched across the face of the profile and was made horizontal by means of a spirit level. Strings, weighted at the lower end and conveniently marked at 6-in. intervals, were then suspended from the top of the profile. These were placed 1 ft. distant from each other and were adjusted so that one of the 6-in. marks coincided with the horizontal base line. Thus the profile was blocked off, and the use of the horizontal base line allowed the slope of the profile to be shown. The various horizons could be outlined rapidly and accurately by the use of a similarly blocked sketch paper." Parts of drawings of three profiles are shown, and detailed descriptions of the soils illustrated are given.

A general conclusion indicated by such profile drawings is that the Podzols which have a bleicherde and orterde only exhibit extremely irregular but more or less continuous horizons occurring in a predictable succession, while the Podzols which by reason of parent material or climatic conditions have developed an ortstein exhibit extremely irregular discontinuous B horizons which, although they tend to occur in a typical succession, may occur in some unpredictable sequence.

Effect of soil type, slope, and surface conditions on intake of water, F. L. Duley and L. L. Kelly. (Coop. U. S. D. A.). (*Nebraska Sta. Res. Bul. 112 (1939), pp. 16, figs. 5*).—The authors sprinkled 0.005-acre plats of various soils from an overhead oscillating sprinkling device with fan-shaped nozzles. A constant water head was maintained by pumping from a large supply tank into a smaller, elevated, constant-level tank. The rate of application was determined by a special water meter, and the run-off was measured in a two-compartment tank calibrated to 0.001 in. of run-off from the plat area. The time required for a given run-off to take place was read on a stop watch. From these data rate curves for both run-off and infiltration were obtained.

The rate of intake of water at the beginning of application was often very high, decreasing rapidly at first, and finally reaching an approximately constant infiltration rate. The total intake of water and also the final infiltration rates

on cultivated bare land showed much less variation among the different soil types than was anticipated. The soils tested varied greatly in the texture of the surface soil and in profile characteristics, but the quantity of water taken in during a given time was strikingly similar for all soils, and the infiltration rates were finally reduced almost to a common level. Even sandy soils closed up until infiltration was very slow.

The total intake and the infiltration rate decreased slightly with increase in slope. However, this change in infiltration rate was found very small and very gradual with changes in slope above about 2 percent.

There seemed to be no consistent or significant difference in the rate of infiltration due to difference in the rate of application of water when the rate of application materially exceeded the rate of intake. With continuous application of water the rate of infiltration gradually decreased to a point where it became nearly, but not absolutely, constant. A plat which received water and was then allowed to stand for a short time showed a sharp decrease in the infiltration rate. However, upon standing for several days or a week and then receiving another application the infiltration rate approached a constant usually higher than that at the end of the previous application period. This rate was again reduced after the plat had again stood in a wet condition.

Soils covered with a crop showed a much higher rate of intake of water than bare soils and maintained this higher infiltration rate throughout extended tests. The denser crops like native sod and alfalfa showed the highest and the longest maintained infiltration rates. Sod land with grass clipped close and surface debris removed showed a rate only a little above that of bare cultivated soil. Soil covered with crop residue such as straw or other organic material gave an infiltration rate similar to or possibly higher than that obtained when the soil was protected by a dense growing crop. The total intake of water when the soil was thus protected was very great on all the soil types tested, and the high rate of intake was maintained over an extended period. In fact, it was sufficient to take care of an amount of water greater than that likely to be received during any rainfall period in Nebraska. Claypan soils (Pawnee clay loam and Butler silty clay loam) absorbed large quantities of water within a short period of time whenever the surface was protected by means of a straw mulch.

"There may be far greater variation between the rates obtained under different surface conditions on a single soil than would be shown by different soils having the same surface conditions. This may make it necessary to think of infiltration rates characteristic of surface conditions rather than of different soils. . . .

"The breaking down of soil structure, by the compacting effect of the rain and the assorting and rearranging of the soil particles by running water forming a compacted layer at the immediate surface, appears to be the principal reason for the low infiltration rates on cultivated land. The formation of this semipervious layer, often only a few millimeters thick, was largely prevented by a covering of straw or by a growing crop."

Boron as a fertilizer for western Oregon soils, W. L. Powers. (Oreg. Expt. Sta.). (*Science, 90 (1939), No. 2324, pp. 36, 37*).—This is a brief summary on the value of minor elements in Oregon soil fertility and plant nutrition, including experiments by the author showing that alfalfa yellow top can be controlled by use of 30 lb. of boric acid per acre; that the use of boron to correct malnutrition in plants has doubled their boron content, slightly affected the protein content, and raised the chlorophyll content 50 percent; that break-down of table beets has been controlled in greenhouse and field; and that symptoms of boron deficiency in celery, asters, broccoli, and cabbage have yielded in a promising way to soil applications of boron. The indicated effects of boron are summarized, and recommendations as to forms of boron and methods of application are given.

AGRICULTURAL BOTANY

[Abstracts of papers presented at the Washington meeting of the National Academy of Sciences, April 1939] (*Science, 89 (1939), No. 2314, pp. 400, 401, 402*).—Abstracts of the following papers of interest to botany are included: Changes of Viscosity and Cell Activity, by W. H. Lewis; The Time Factor in X-Ray Irradiation [*Tradescantia*], by K. Sax; Rhythmical Impulses in the Heart and in a Plant Cell (*Nitella*), by W. J. V. Osterhout and S. E. Hill; Induction of periclinal chimeras in *Datura stramonium* by colchicine treatment, by A. F. Blakeslee, A. D. Bergner, S. Satina, and E. W. Sinnott; The Chemical Induction of Genetic Changes in Fungi, by C. Thom and R. A. Steinberg; and Cellular Relationships During Growth and Differentiation in Plant Growing Points, by E. W. Sinnott.

[Botanical reviews] (In *Annual Review of Biochemistry, VIII*, edited by J. M. Luck and J. H. C. Smith. *Stanford University, Calif.: Stanford Univ. Press, 1939, vol. 8, pp. 483–540, 611–626*).—The following critical reviews included, each with copious bibliographies, are of special interest to botany: Chemical Aspects of Photosynthesis, by H. Gaffron (pp. 483–502); Mineral Nutrition of Plants, by J. W. Shive and W. R. Robbins (pp. 503–520) (Rutgers Univ.); Growth Hormones in the Higher Plants, by F. W. Went (pp. 521–540); and The Biochemistry of Yeast, by E. I. Fulmer (pp. 611–626) (Iowa State Col.).

Amendments proposed to the international rules of botanical nomenclature (1935), C. X. Furtado (*Gard. Bul. Straits Settlements, 11 (1939), No. 1, pp. 30*).—See also a previous note (E. S. R., 75, p. 753).

The principal orientations of present day biocoenology or plant sociology [trans. title], H. Gams (*Chron. Bot., 5 (1939), No. 2–3, pp. 133–140*).—Modern trends in plant ecology are critically reviewed, with copious references to the work of many investigators of this field.

International cooperation among herbaria and taxonomists (*Chron. Bot., 5 (1939), No. 2–3, pp. 140–150*).—It is concluded from this discussion that international cooperation in plant science is best promoted by international societies of specialists looking after the scientific, professional, and social interests of their members. Therefore, it is suggested that perhaps the time is ripe for establishing an international society of plant taxonomists. As examples of the sort of efforts needed, the current steps in establishing a catalog of the content of the herbaria of the world and in working out a list of standard abbreviations for herbarium use are discussed. The report of J. Lanjouw, On the Standardization of Herbarium Abbreviations, is appended, with a revised list of abbreviations presented for approval.

An automatic plant irrigator and recorder, C. N. Johnston and O. A. Atkins. (Univ. Calif.). (*Plant Physiol., 14 (1939), No. 2, pp. 391–393, fig. 1*).—The apparatus described and illustrated is said to supply automatically the soil mass within the pot with sufficient water to bring all parts of the contained soil to field capacity, and in addition a counter operated by a mechanism records the number of irrigations applied. Details of construction and operation are given.

Suggestions for the use of Warburg respirometers in plant physiological investigations, J. W. Brown (*Plant Physiol., 14 (1939), No. 2, pp. 309–320, figs. 2*).—Studying the O_2 consumption and CO_2 production of acorns, it was found that the accuracy of this method could be increased by certain modifications: A correction should be made for the absorption of O_2 during the interval between the final O_2 and CO_2 readings. Theoretically, a correction should be considered for the solubility of these gases in the reagents before and after mixing, but since reliable solubility values are frequently unavailable for these reagents

more accurate results may be had by omitting a correction for solubility. Differences in respirometer volume prevent direct application of a control correction for CO_2 in the reagents. A sample set of recordings and calculations is presented.

Taxonomy and floristics of the Americas, H. N. MOLDENKE (*Chron. Bot., 5 (1939), No. 2–3, pp. 172–176*).—A review.

Advances in the systematics of flowering plants [trans. title,] H. SLEUMER (*Chron. Bot., 5 (1939), No. 2–3, pp. 169, 170*).—A review of recent contributions.

Taraxacum laevigatum f. scapifolium, a new form of dandelion, F. C. GATES and S. F. PRINCE (Kans. State Col.). (*Kans. Acad. Sci. Trans., 41 (1938), pp. 119, 120, figs. 7*).—"Since this form suddenly appeared in the general population [southwestern Missouri], has bred true in all the experimental plantings conducted, and has assumed dominance in the dandelion population, it would seem reasonable to give it a name."

The **alien plant population of California**, W. W. ROBBINS. (Univ. Calif.). (*Calif. Dept. Agr. Bul., 28 (1939), No. 2, pp. 163–165*).—This is a brief summary of known data on introduced plants growing without cultivation in California, of which there are said to be about 500 species. Of these, some 125 species have become established as weeds of great agricultural significance, while a number of others may be troublesome locally. About 75 percent of the total number of alien plants are introductions from Europe and Asia, while fully 15 percent of these are from the Mediterranean region. Apparently the introduction of alien plants has been largely determined by the movements of peoples. At the time of writing there was said to be a number of plant immigrants, recognized in other parts of the world as bad weeds and manifesting the same tendencies under California conditions, which thus far have a relatively limited distribution in the State. The need for control and eradication is stressed.

The central bureau for fungus cultures, Baarn (Netherlands): List of cultures, 1939, J. WESTERDIJK (*Centraalbureau voor Schimmelcultures, Baarn (Holland): List of cultures, 1939. Amsterdam: K. Akad. Wetensch., 1939, pp. 132, fig. 1*).—This is the list of fungus species for which cultures are now available (E. S. R., 79, p. 606).

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact., 38 (1939), No. 1, pp. 110, 111, 112, 115, 116*).—Abstracts of the following papers of interest to botany are included: Effect of Biotin Concentrates on Growth of *Rhizobium* and Related Species, by P. M. West and P. W. Wilson (Univ. Wis.); Note on the Preparation of Active Cell-Free Juice From Bacteria, by W. P. Wiggert, M. Silverman, M. F. Utter, and C. H. Werkman (Iowa State Col.); Preparation of Bacteriological Peptones, by E. Leifson and B. Diamond; Evidence for the Aerobic Decomposition of Lignin by Lake Bacteria, by J. Stadler and C. E. ZoBell, and The Effect of Oxygen Tension on Oxygen Consumption by Bacteria in Lake Water, by C. E. ZoBell and J. Stadler (both Univ. Wis.); and A Fermentation Calorimeter for the Study of Heat Evolution in the Decomposition of Plant Materials, by R. E. Carlyle and A. G. Norman (Iowa State Col.).

Studies on the Proactinomyces, W. W. UMBREIT. (N. J. Expt. Stas.). (*Jour. Bact., 38 (1939), No. 1, pp. 73–89*).—This study of several well-defined species and many unidentified forms of the genus are believed to indicate that the criteria for its separation from the *Actinomyces* proper (absence of spore formation) are valid. Two subgroups are defined, and the relations of the lower limits of the genus to *Corynebacterium* and *Mycobacterium* are discussed.

Adaptation of the propionic-acid bacteria to vitamin B_1 synthesis, including a method of assay, M. SILVERMAN and C. H. WERKMAN. (Iowa State Col.). (*Jour. Bact., 38 (1939), No. 1, pp. 25–32, fig. 1*).—The method of assay for

vitamin B_1 described is based on the increased anaerobic pyruvate metabolism of *B_1-deficient cells of Propionibacterium pentosaceum on addition of this vitamin.* If transferred continuously on a basal medium free of B_1 it can be adapted to *synthesize this vitamin to satisfy growth requirements.*

CO_2 utilization during the dissimilation of glycerol by the propionic acid bacteria, A. S. PHELPS, M. J. JOHNSON, and W. H. PETERSON. (Wis. Expt. Sta. et al.). (*Biochem. Jour., 33 (1939), No. 5, pp. 726–728*).—"The report of [H. G.] Wood and [C. H.] Werkman[2] that the propionic acid bacteria utilize CO_2 during the dissimilation of glycerol has been confirmed."

Disintegration of the cell membrane of the cotton fiber by a pure culture of bacteria, F. E. HOOPER (*Contrib. Boyce Thompson Inst., 10 (1939), No. 3, pp. 267–275, figs. 3*).—An aerobic bacterial rod capable of growing on inorganic media with such material as filter paper and cotton as the sole carbon source was isolated from the soil, studied in detail, and its disintegration of cotton fibers followed microscopically. The cuticle is removed early in the attack, and then both cementing material and cellulose are slowly digested. The particulate nature of the cellulose fibrils of the cell wall is clearly seen in the partially disintegrated fibers.

Leguminous plants and their associated organisms, J. K. WILSON (*[New York] Cornell Sta. Mem. 221 (1939), pp. 48, pls. 10, fig. 1*).—In this study emphasis was placed on the host-bacterial relationships and on the attempts by previous workers (17 references) to establish definite plant-bacterial groups. Methods developed for growing the symbionts together in closed containers provided a possibility of drawing rather definite conclusions. About 200 plant species in over 70 genera, and 32 *Rhizobium* strains, were used—isolated from a wide range of hosts and representing most of the host-bacterial groups that have been proposed. After examination of over 12,000 tests, the main conclusion drawn was that neither a sufficient number of plant species nor a sufficient number of diverse strains of bacteria have been employed previously in studying the comparative symbiotic relations to justify establishing definite plant-bacterial groups or to encourage use of those that have been proposed. This conclusion was reached because tests with the 32 *Rhizobium* strains representing most of these plant-bacterial groups indicated that many plants not assigned to any one of these groups could be placed in as many as 12 of them. Further support came from the fact that the boundaries surrounding plants from each proposed group also proved to be irregular. Data were also obtained indicating that many plants will symbiose simultaneously with several *Rhizobium* strains representing several plant-bacterial groups, while other plants are apparently somewhat restricted in this respect. Another conclusion is that plants which are promiscuous tend to symbiose with strains that are predominantly either monotrichic or multitrichic, while those which are restricted tend to symbiose only with the former.

The carbohydrate-nitrogen relation in legume symbiosis, P. W. WILSON and E. B. FRED. (Univ. Wis.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 6, pp. 497–502*).—In reply to criticisms of Allison and Ludwig (E. S. R., 81, p. 487), the advantages claimed for the carbohydrate-nitrogen hypothesis over the carbohydrate supply hypothesis are discussed in detail in that "it combines in a single hypothesis consideration of both supply of nitrogen and of carbohydrate and thus replaces both," and "the Ch : N relation has several definite measures of varying degrees of refinement, whereas the carbohydrate supply hypothesis has, in the past, employed such concepts as 'available carbohydrate' and 'metabolizable carbon' without specifying methods for their estimation." It is

[2] Biochem. Jour., 30 (1936), No. 1, pp. 48–53.

believed to be an oversimplification to consider carbohydrate supply as the primary factor in legume symbiosis and to relegate the supply of nitrogen to the secondary role of serving as one method of control of carbohydrate. The point is stressed that the major requirement at this time for advancement in the understanding of legume symbiosis biochemistry is experimental facts. If any hypothesis suggests means for obtaining these facts, its use will be justified. There are 13 references.

Response of non-symbiotic nitrogen-fixing and nitrifying bacteria to different soil fertilization practices, J. L. ROBERTS (*Indiana Sta. Rpt. 1938, p. 43*).—This is a brief progress report.

Botanical aspects of soil conservation, R. O. WHYTE (*Chron. Bot., 5 (1939), No. 2–3, pp. 180–182*).—A review with citations.

New developments in our knowledge of how plants feed, L. D. BAVER (Ohio State Univ.). (*Ohio Veg. and Potato Growers Assoc. Proc., 24 (1939), pp. 68–73*).—A brief semipopular summary of recent findings relative to the way in which plants feed in soils.

Electrical response of Phaseolus multiflorus to electrical currents, W. S. REHM (*Plant Physiol., 14 (1939), No. 2, pp. 359–363, figs. 4*).—It is shown that in *P. multiflorus* relatively small currents produce an effect dependent on the current direction, while stronger currents produce in the main axis and petioles an increase in basal positivity. It was previously demonstrated that decapitation produced a similar result (E. S. R., 79, p. 309). Both phenomena indicate a latent oriented inherent mechanism capable of producing comparatively large electrical potentials roughly comparable to the situation in nerves and muscles. In the latter tissues stimuli produce an electrical response determined by an inherent oriented mechanism. The analogy suggests that this electrical response may play a part in the economy of the plant. It was also previously shown that in this plant there is an intimate relation between the orientation of bioelectric potentials and morphology. In this connection it is noted that the main electrical polarity of *P. multiflorus* was one of basal positivity.

Physico-chemical studies on the nature of cold resistance in crop plants (*Nebraska Sta. Rpt. 1938, pp. 8–10*).—A progress report, with particular reference to potato, nursery stock, wheat, and barley, and to the relation of bunt infection to hardiness.

***Determination of constants for curves of water absorption by dry* organic substances,** C. A. and S. P. SHULL (*Plant Physiol., 14 (1939), No. 2, pp. 351–357*).—Following up earlier studies of water absorption by dry organic matter such as seeds (E. S. R., 44, p. 728) and gelatin disks (E. S. R., 45, p. 525), the authors point out some of the details of the mathematical processes involved and illustrate the derivation of the original constants whereby approximate values may be obtained for the testing of fit.

The effect of dehydration on microsporogenesis in Tradescantia, N. GILES (*Amer. Jour. Bot., 26 (1939), No. 5, pp. 334–339, figs. 9*).—The cellular water content of the buds was reduced during microsporogenesis by paraffin sealing of the cut ends of stems kept in water or by failing to water potted plants for several days. Such dehydration caused suppression of the spindle at one or both ends of the meiotic divisions, producing diploid and tetraploid microspores and pollen grains. The larger (probably octoploid) pollen grains occasionally noted are attributed to inhibition of the last premeiotic mitosis and both meiotic divisions. Cytokinesis by cell plate formation was also inhibited, in which case division by furrowing, not coordinated with nuclear division, often occurred. Nuclear without cellular division also occurred, producing bi- and quadrinucleate cells. Chromosome length in haploid microspores from buds of cut stems allowed

to wilt for 24 hr. was reduced to two-thirds the normal. These abnormalities are said to resemble those produced by many other agents (e. g., temperature, chemicals, and radiation), and to result from disturbance of the coordination of three apparently independent though normally synchronized events, viz, chromosome, nuclear, and cellular divisions. It is suggested that variations in the water supply may be important in producing polyploid gametes and consequently of polyploid races under natural conditions.

The relative humidity gradient of stomatal transpiration, H. F. THUT (*Amer. Jour. Bot.*, *26 (1939), No. 5, pp. 315–319, figs. 4*).—This humidity gradient was demonstrated by measuring the relative humidity or equivalent of the leaf tissues and the humidity of the stomatal openings and intercellular spaces of normal well-watered and wilted plants, and the humidity of the external air. The tissue humidities were measured by the suction tension or diffusion pressure deficit method. Measurements of the humidity of the stomatal openings and intercellular spaces were made by noting the effects of various relative humidities on transpiration by exposing small parts of mature leaves over humidity bottles containing H_2SO_4 solutions or NaOH pellets, with the rest of the plant under usual laboratory conditions. The water loss from such leaves was an inverse linear function of the relative humidity, but in the region of high relative humidity water was absorbed from the bottles and not lost. The zero point of water loss from the leaves to the humidity bottles is interpreted as the relative humidity of the stomatal openings and intercellular spaces. The air humidity was measured by psychrometer.

A normal *Lantana* leaf showed a relative humidity of 99.4 percent in the tissues, 91 percent in the stomatal openings and intercellular spaces, and 40–48 percent in the external air. A wilted leaf gave respective humidities of 98.6 and 65 percent, with 40–48 percent for the air. Comparable results were obtained with bean, sunflower, and *Petunia*.

Relation of stomatal opening to water soaking of tobacco leaves, S. DIACHUN and W. D. VALLEAU. (Ky. Expt. Sta.). (*Amer. Jour. Bot.*, *26 (1939), No. 5, pp. 347–351, figs. 2*).—Susceptibility to water soaking by a stream of water was determined largely by the degree of opening and condition of the stomata. With open stomata during the day the leaves could be water-soaked easily and rapidly, while with them nearly or quite closed at night the leaves became water-soaked only with difficulty. Wilting or shaded leaves water-soaked slowly, and the stomata here were found to be nearly or quite closed. Middle leaves of mature Burley plants water-soaked more rapidly than tip or basal leaves. Stomata were not fully developed on the tip leaves, while they were always nearly or quite closed on the basal leaves. It is suggested that the method here described and used may be adapted as an indirect method for studying stomatal behavior.

The morphological and cytological development of the sporophylls and seed of Juniperus virginiana L., A. C. MATHEWS. (Univ. N. C.). (*Jour. Elisha Mitchell Sci. Soc.*, *55 (1939), No. 1, pp. 7–62, pls. 9*).—This paper includes a historical introduction (with 70 references), a description of materials and methods, and discussions of the detailed results of studies of the staminate cone and the microsporophyll, meiosis of the pollen mother cell and the fate of the microsporangial wall layers, pollination, the male gametophyte, the morphological development (including notes on the comparative morphology) of the ovulate strobilus, the stony layer, the megasporangium, the female gametophyte, fertilization, embryo formation, and the embryogeny of the Cupressineae and related groups.

Development and structure of the phloem tissue, K. Esau. (Univ. Calif.). (*Bot. Rev., 5 (1939), No. 7, pp. 373–432, figs. 27*).—The conclusions from this comprehensive review (nearly five pages of references) are that the modern concept of the phloem is that of a tissue containing highly specialized elongated enucleate cells with permeable cytoplasm, arranged in longitudinal rows and forming anastomosing strands together with the parenchymatous members. These specialized cells (sieve-tube elements or their counterparts) are intimately connected with one another. In most plants these connections are localized in wall areas occupied by sieve plates or by similar structures comparable to highly developed simple pits. The connecting strands are larger than ordinary plasmodesmata and are usually associated with variable amounts of callose in the wall region traversed. The parenchyma cells show different degrees of ontogenetic and physiologic relation to the sieve-tube elements. The angiosperm companion cells are most closely associated with the sieve-tube elements, then follow the albuminous cells of gymnosperms, and finally the phloem parenchyma and ray cells. When the sieve tubes reach maturity their protoplasts are in a premortal state. Thus these elements are rather short-lived, and the companion and albuminous cells die at the same time as the sieve tubes.

Phloem development and flowering, B. E. Struckmeyer and R. H. Roberts. (Wis. Expt. Sta.). (*Bot. Gaz., 100 (1939), No. 3, pp. 600–606, figs. 18*).—In continuation of studies of anatomy in relation to flowering (E. S. R., 77, p. 601), it was found from observations of the phloem of stems of a large number of plants that there are a greater number of sieve tubes and companion cells in the nonflowering than in the flowering stems and that these cells are also generally larger in the vegetative stems. Some of the phloem cells in flowering stems of many plants are crushed. The cambium in flowering stems of many plants becomes less active, and phloem parenchyma instead of sieve tubes and companion cells is formed. There is more callose in the phloem cells of flowering than of nonflowering stems. These characteristics were observed at the same time as the appearance of blossom primordia in several species.

Effect of photoperiod on development and metabolism of the Biloxi soybean, M. W. Parker and H. A. Borthwick. (U. S. D. A.). (*Bot. Gaz., 100 (1939), No. 3, pp. 651–689, figs. 17*).—Biloxi soybeans with flower primordia initiated were transferred to photoperiods of 8, 10, 12, 13, 14, 15, 16, and 18 hr., and the development of these primordia and the flowering and fruiting responses determined. Plants transferred to 8- to 13-hr. days bloomed nearly simultaneously and produced fruits, but yields were somewhat less for the 8- than for the 10-, 12-, and 13-hr. lots. Flowering on the 14- and 15-hr. plants was later than for the shorter days, flowers were fewer, and no fruits developed. No flowers opened on the 16- and 18-hr. plants during the test period. When transferred to a range of photoperiods after flower primordium initiation, the longest day on which fruit formed was 13 hr., and the shortest one on which no flowers formed was 16 hr.

After initiation of flower primordia, plants were grown for biochemical studies on 8-, 13-, and 16-hr. days, with a control lot on a continuous 16-hr. day. At the end of a week's induction period the total nitrogen and soluble nonprotein N were higher in the 8-hr. plants than in the controls, but the carbohydrates were lower except for starch in the leaves which was higher. The total N in both stems and leaves of the 16-hr. transfers became similar to that of the controls, and the 13-hr. transfers approached the 8-hr. ones as the season advanced. The soluble nonprotein N showed the same relationship in the stems. There was an abrupt rise in ammonia in the leaves and stems of the 8- and 13-hr. transfers when pods began to form. The amount of soluble carbohydrates in the transfer

groups seemed to be correlated with the day length. Starch accumulated in the leaves and stems of the 8- and 13-hr. transfers when pods began to form. Two groups of plants with flower buds initiated and subsequently grown at day lengths just above and below the critical showed progressive deviation from each other in their carbohydrate and N metabolism. Those grown below the critical became similar to plants grown on an 8-hr. day, while those above the critical became similar to plants kept vegetative by continuous growth on a 16-hr. day.

Nitrogen nutrition in relation to photoperiodism in Xanthium pennsylvanicum, E. K. Nemle (*Bot. Gaz., 100 (1939), No. 3, pp. 607–618, fig. 1*).—Plants in sand culture with very little or abundant nitrogen were first grown under long photoperiod, and then all were given an induction period of seven short photoperiods after which half were returned to long and half were left under short photoperiod. The latter group with abundant N bloomed first, those of this type with low N bloomed next, those under long photoperiod with high N were third, and those of this type with low N were fourth in time of blooming. Of the short-day plants, those with abundant N produced the greatest number of staminate heads, while all on long photoperiod produced more staminate flower clusters than those on short photoperiod. The percentage of abortive pollen was greatest in the short-day plants. In the latter a low N supply resulted in the greatest number of defective pollen grains, and in the long-day plants a high N supply had the same effect. There were more fruits per average plant in the short- than in the long-day plants. Under either short or long day, plants with abundant N had many more burs than those with a low supply. More seeds were found on the long-day plants, because many of the short-day plants had empty burs, many of the latter developing parthenocarpically. Plants grown under long-day treatment following an induction period with low N supply bore fruits and were larger than controls grown under long day with no induction period but with a similar low N supply. The latter bore no fruits.

Protein metabolism in the plant, A. C. Chibnall (*New Haven: Yale Univ. Press; London: Oxford Univ. Press, 1939, pp. XV+306, pls. 3, figs. 21*).—In this book the author's Yale University "Silliman Lectures" are presented in expanded form. The first four chapters discuss the question of protein metabolism in seedlings, consolidating the scattered contributions of many of the earlier investigators and attempting to show that their work cannot be viewed in true historical perspective except in terms of contemporary protein chemistry. Since this part is deemed of special interest to both biochemistry and plant physiology it is presented in considerable detail. The remaining chapters deal largely with the proteins of leaves and their metabolism, including considerable speculative material. The discussions here are grouped under the mechanism of amino acid and protein synthesis in plants, preparation of proteins from leaves, proteins of pasture plants, protein metabolism in leaves, the role of proteins in the respiration of detached leaves, and the regulation of protein metabolism in leaves. Appendixes take up the impurities in leaf-protein preparations and their bearing on the estimation of some amino acids; the estimation of nitrogenous bases, dicarboxylic acids, and amide nitrogen in the impure leaf-protein preparations; and the lipoid fraction of chloroplasts.

Distribution of different nitrogen fractions, sugars, and other substances in various sections of the pineapple plant grown in soil cultures and receiving either ammonium or nitrate salts, C. P. Sideris, B. H. Krauss, and H. Y. Young. (Hawaii. Pineapple Prod. Expt. Sta.). (*Plant Physiol., 14 (1939), No. 2, pp. 227–254, figs. 11*).—Pineapple plants grown in nonsterilized soil weighed more when in cultures receiving ammonium than when receiving nitrate salts, but the chemical composition of the different sections of the leaves and

stems in both series tended to be about the same. The most outstanding result was the abundance of nitrate found in the stem and nonchlorophyllous basal leaf tissues of the leaves of plants receiving ammonium. The protein content of the leaves of plants in the nitrate series was slightly higher than in the ammonium group, but the soluble organic nitrogen was higher in plants of the ammonium series. As ammonium is assimilated very rapidly, inorganic N consisted mostly of nitrate, which was high in the stem and in the nonchlorophyllous sections of the leaves in both series. It is concluded that the chemical composition of plants grown in nonsterilized soil and receiving either ammonium or nitrate salts as N sources varies very little because of the conversion of ammonium to nitrate by the nitrifying bacteria of the soil.

Some remarks on the growth of the starch grain, N. P. BADENHUIZEN (*Chron. Bot., 5 (1939), No. 2–3, pp. 199–201*).—A discussion and review.

Translocation of carbohydrates in the Cuthbert raspberry, C. J. ENGARD (Wash. State Col.). (*Bot. Gaz., 100 (1939), No. 3, pp. 439–464, figs. 4*).—In this study, double rings (one 15 cm. and one 30 cm. above the ground) were used to check the movements of sugars in the stems. In normal plants the concentration of total carbohydrates proved to be fairly high in May, dropped during June, and became maximum in August, the acid hydrolyzable ones constituting the largest fraction. The reducing sugar content was highest in May, dropped rapidly in June, and increased slightly in July and August. A low concentration of sucrose was present at all times, but starch was never abundant and apparently is not an important reserve. In ringed plants the total carbohydrates accumulated above the rings, and decreased below and between them. Sucrose made the largest increase above the rings, and reducing sugars accumulated above but decreased between and below them. Sucrose apparently tended to move upward as well as downward in the bark. It does not appear to result from hydrolysis of hemicellulose in the isolated segment as do the reducing sugars. A part of the reducing sugars is translocatory, moving downward in the bark. All carbohydrate gradients were positive. Sugars moved downward with a marked positive gradient. The positive gradients of the acid hydrolyzable substances and of starch were static. These gradients are produced by temporary storage. Ringing decreased the positive gradients of reducing sugars, indicating that some of them are mobile in the bark along a dynamic positive gradient. Much of the reducing sugars may be in temporary storage forms. Therefore, their positive gradient results from a positive dynamic gradient of reducing sugars and a positive static gradient of temporary storage sugars. The insignificant gradient of sucrose is increased rather than decreased, as would be expected if this sugar were moving only downward. The residual substances consisted of those polysaccharides, small amounts of fats, minerals, and organic nitrogen which remained after the total carbohydrates were subtracted from the dry weight. The residual polysaccharides are believed to include the "intussusception" material (polysaccharides of high molecular weight and their derivatives) of the cell wall. They fluctuate as the total carbohydrates (particularly reducing sugars and the "hemicelluloses") fluctuate, and in the same direction. There are 32 references.

Carbohydrate and respiratory metabolism in the isolated starving leaf of wheat, G. KROTKOV (*Plant Physiol., 14 (1939), No. 2, pp. 203–226, figs. 12*).—"Data are presented on the changes in the rate of CO_2 emission and in the content of simple and complex sugars which proceed in the cells of isolated, first foliage leaves of wheat starving in the dark. The dual form of the highly characteristic changes in the rate of CO_2 emission is shown to have its origin in the degradation of two categories of substances to yield respiratory substrate. The

two categories are the original primary reserve of sugars on the one hand, and on the other a variety of substances, some of which are of significance in protoplasmic organization. The manner of depletion of reserve sugar controls the course of starvation metabolism in its early stages. The depletion of secondary substrate materials guides the metabolic drift in the later stages and finally causes it to terminate suddenly in autolytic disorganization." There are 13 references.

The chlorophyll-carbon dioxide ratio during photosynthesis, E. D. McAlister (*Jour. Gen. Physiol., 22 (1939), No. 5, pp. 613–636, figs. 9; abs. in Chron. Bot., 5 (1939), No. 2–3, pp. 156, 157, figs. 4*).—Using a method of CO_2 measurement described before (E. S. R., 77, p. 458), the time course of photosynthesis was further studied on Marquis wheat. A highly important finding was that immediately after a high rate of photosynthesis there is a pick-up of CO_2 in darkness believed to be due to the action of a CO_2-combining intermediate—the "acceptor molecule" for CO_2 in photosynthesis. The observed conditions appear to indicate that this intermediate is formed in relatively large amounts during but not before photosynthesis, and that it is of chlorophyllous nature. Further studies of the induction phase under various conditions of previous dark rest and of CO_2 and light limitation are believed to indicate that chlorophyll participates in photosynthesis as an individual molecule and not as part of a very large multimolecular chlorophyll unit. The fast dark reaction lasting about 1 min. required to produce both the phenomena of induction in CO_2 assimilation and the recovery of fluorescence of chlorophyll shows a close relationship between chlorophyll fluorescence and induction in photosynthesis. The respiration rate of wheat was measured under intense illumination and in the absence of CO_2 to suppress assimilation. This value was found to be identical with the dark respirational rate measured before and after the light period, indicating the absence of any direct effect of light on respiration.

Condition of chlorophyll in the leaf, O. L. Inman and M. L. Crowell (*Plant Physiol., 14 (1939), No. 2, pp. 388–390, figs. 2*).—The authors studied the physical and chemical states of chlorophyll after grinding *Trifolium repens* leaves with sand, extracting with buffer, filtering, and centrifuging so that only the colloidal material was retained as the triturate. From the results of treatment with trypsin and CO_2 it is concluded that trypsin probably causes Mg to be freed from the chlorophyll molecules with formation of pheophytin, and makes the chlorophyll molecules of the triturate more susceptible to displacement of the Mg by addition of CO_2. No pheophytin formation was observed when the triturate was definitely alkaline. One plausible assumption advanced is that the chlorophyll pigments may be bound to their substrate through a Mg-protein linkage.

Organic acid metabolism of the buckwheat plant, G. W. Pucher, A. J. Wakeman, and H. B. Vickery. (Conn. [New Haven] Expt. Sta. et al.). (*Plant Physiol., 14 (1939), No. 2, pp. 333–340*).—Oxalic, malic, and citric acids were found to make up ±90 percent of the organic acids of the leaf and ±72 percent of those in the stem, oxalic predominating, malic being present in relatively smaller amounts, and citric acid in minor proportions. The leaves of one plant contained ±1.5 times as much total acid as the stem. During maximum illumination photosynthesis was most active and the organic acids increased, though there was a decrease in H-ion activity of the sap in the stem. In the later part of the day malic acid was utilized and there was an increase in the unknown organic acids. The net change in the total organic acids was a small increase, but the H-ion activity of the sap of the stem increased to about the early morning level. Photosynthesis was much less active in this

period, and inorganic-ion assimilation from the culture solution was also depressed. During the night there was a small increase in total organic acids and a marked interconversion of unknown acids into one or more of the known acids. There was no change in H-ion activity in the sap of the stem. The evidence is believed to indicate that interpretations of the changes in H-ion activity of the sap in terms of an increase or decrease in organic acids cannot be made in the absence of specific information regarding these substances. It is deemed obvious that such factors as absorption of inorganic ions by the roots and the distribution of the inorganic and organic basic constituents within the tissues, as well as photosynthesis, play an important role in the acidity changes occurring. There are 16 references.

An electro-chemical theory of salt absorption and respiration, H. Lundegårdh (*Nature [London], 143 (1939), No. 3614, pp. 203, 204*).—The theory of "anion respiration" here presented and outlined refers to cells with a pronouncedly acid protoplasmic membrane, which seems to be characteristic of plant roots though other kinds of cells may behave differently. Potential gradients in protoplasmic boundaries are believed to be of fundamental importance in both the metabolism and translocation of substances within the organism. From this viewpoint the investigations of ion absorption by roots may have a wider application.

Metabolism and salt absorption by plants, D. R. Hoagland and F. C. Steward. (Univ. Calif. et al.). (*Nature [London], 143 (1939), No. 3633, pp. 1031, 1032*).—A critique of Lundegårdh's theory, noted above.

Upward and lateral movement of salt in certain plants as indicated by radioactive isotopes of potassium, sodium, and phosphorus absorbed by roots, P. R. Stout and D. R. Hoagland. (Univ. Calif.). (*Amer. Jour. Bot., 26 (1939), No. 5, pp. 320–324, figs. 2*).—Radioactive isotopes of K, Na, P, and Br were used to study the upward movement of salts in actively growing and transpiring willow and geranium, after absorption by their roots. The technic of isolating a strip of bark from the wood was followed, in which these substances moved extremely slowly. Within short periods no definitely significant amount of radioactivity was detected in the central section of the strip, while large amounts were found in the wood. However, where wood and bark were in contact, radioactive elements were rapidly transferred laterally from wood to bark. This evidence is deemed consistent with the view that the xylem is the path of rapid upward movement of salts.

Differential distribution of ash in stems of herbaceous plants from base to tip, A. E. Edgecombe (*Amer. Jour. Bot., 26 (1939), No. 5, pp. 324–328*).—Six herbaceous species were grown 4 mo. under uniform greenhouse conditions. Spring and winter plants were examined separately for comparisons, all tests were in duplicate, composite samples from specific stem regions were used, and the water content was calculated from the wet and dry weights. Stem-tissue samples from base to tip of plant showed an increasing ash gradient on the dry-weight basis and a decreasing ash gradient and an increasing water gradient on the wet-weight basis. The ash and water gradients of these plants were in general the reverse of those found for worms, except for the ash content on the dry-weight basis which was similar. However, the ash content on the dry-weight basis and the water content on the wet-weight basis for both plants and worms were correlated with the metabolic gradient and paralled the direction of growth. Except for the ash gradient on the wet-weight basis, the ash and water gradients of these plants were in the main of the same order and direction as those found for rose plants.

Transport of inorganic ions in polar plant tissues, F. W. Went (*Plant Physiol., 14 (1939), No. 2, pp. 365–369*).—Studying the transport of some radioactive elements in polar plant tissues by two types of experiment described, it was found that in the same tissues simultaneously there occurs a polar auxin transport and a nonpolar movement of inorganic ions. Thus it is believed that there is no escape from the idea that the movements of auxin and of Na^+, Br^-, and PO_4^- are controlled by completely different mechanisms. This may be viewed as a fundamental difference in the locomotor mechanism for the movement of these substances, or simply as a difference in the path of transport. Whatever the explanation, it is deemed clear that the accumulation mechanism for inorganic ions and the polar transport mechanism for auxin are not identical and must be located in different parts of the cell.

***Experiments with different quantities of iron salts given to maize in water culture*, C. Olsen** (*Compt. Rend. Lab. Carlsberg, Sér. Chim., 21 (1938), No. 23, pp. 301–313, fig. 1*).—Optimum growth of maize in a modified Knop solution at pH 4 was obtained by adding comparatively small amounts of iron, while addition of considerably larger quantities acted toxically. The Fe content of the leaves and stems rose with increasing amounts of added Fe, and more especially when $FeSO_4$ was used. When grown in a nutrient solution at pH 7, the relatively small amounts of Fe producing optimum growth at pH 4 gave plants which were much dwarfed and chlorotic, and not until larger amounts of Fe were given did optimum growth ensue. With amounts of Fe producing optimum growth, plants grown in solutions at pH 7 produced dry matter weighing considerably more than the greatest amount produced in solutions at pH 4. However, the largest amounts of $FeSO_4$ and ferric citrate used in the tests were toxic, even at pH 7. On the other hand, it was not found possible to add enough $Fe_2(SO_4)_3$ to solutions at pH 7 to produce toxic action, and the greatest production of dry matter obtained during the study resulted from adding the greatest amount of $Fe_2(SO_4)_3$ to the solution. The greater toxicity of the ferrous ions to maize is explained on the basis that their solubility is considerably greater than that of the ferric ions. Ferric citrate is said to be especially suitable as a source of Fe for plants in water culture, but should be added at intervals rather than all at once. With mustard, however, it was found necessary to use $Fe_2(SO_4)_3$ in addition to ferric citrate to maintain satisfactory growth.

The essentiality of certain elements in minute quantity for plants with special reference to copper, D. I. Arnon and P. R. Stout. (Univ. Calif.). (*Plant Physiol., 14 (1939), No. 2, pp. 371–375*).—This is a critical review (13 references) of more recent studies of the so-called minor elements and their significance in plant metabolism, with discussions of difficulties involved, warnings as to possible sources of error, and with special reference made to studies by the authors (E. S. R., 81, p. 352).

Relations of plants to minute doses of inhibitive substances, E. S. Reynolds (*Plant Physiol., 14 (1939), No. 2, pp. 385–387*).—The author refers to the results of various investigators with growth substances and traces of mineral salts as showing a stimulatory action when used in minute doses, though becoming inhibitory or toxic in larger quantities. Accommodation to increased or decreased amounts is also noted. Recent observations here detailed relative to oleander cuttings in solutions of heteroauxin are said to have indicated the same type of reactions. These phenomena are briefly discussed, and it is concluded that in any case this preliminary inhibition and final stimulation of plant tissues by toxic substances, thus indicating an accommodation of the

organism to them, points to the necessity of a more careful consideration of such phenomena in physiological studies.

The minor element problem in Ohio greenhouses, I. C. HOFFMAN. (Ohio Expt. Sta.). (*Ohio Veg. and Potato Growers Assoc. Proc., 24 (1939), pp. 54–55*).—A general discussion of Mn, Mg, and Fe deficiency in greenhouse-grown vegetables.

Responses of plants to growth substances applied as solutions and as vapors, P. W. ZIMMERMAN, A. E. HITCHCOCK, and F. WILCOXON (*Contrib. Boyce Thompson Inst., 10 (1939), No. 3, pp. 363–376, figs. 2*).—A review (27 references) of plant responses to growth substances applied in solution and to unsaturated carbon gases is presented. In this study, tomato, corn, Klondike cosmos, marigold, girasol, mimosa, *Chenopodium*, and garden pea responded to 29 compounds applied as vapors which were physiologically active as growth substances when applied in solution, characteristic reactions being induced with exposures as short as 30 sec. The well-known "triple response" of etiolated pea seedlings commonly associated with the effect of ethylene gas was induced with vapors of 17 growth substances. Excessive elongation of etiolated coleoptiles and mesocotyls and pronounced curling and swelling of the internodes of corn occurred on exposure to vapors of these substances in either light or darkness. The similarities in responses induced by the unsaturated hydrocarbon gases and by vapors of growth substances are discussed.

The relative activities of different auxins, K. V. THIMANN and C. L. SCHNEIDER (*Amer. Jour. Bot., 26 (1939), No. 5, pp. 328–333, figs. 4*).—The growth-promoting activities of six pure auxins were compared with that of indole-3-acetic acid, and the ratio of the activity as determined by any method with that of this acid was termed the "relative activity." Relative activities for straight growth as determined for *Avena* coleoptiles differed from those for *Pisum* internodes, and the differences are not believed due to differences in carbohydrate supply. In *Pisum* the values for straight growth differed from those for slit stem curvatures, which is explained on the basis of differential sensitivities of the tissues. With any of the methods the values also varied somewhat with the sensitivity of the plants on the day of the test. By taking the average of several series of tests with each method, approximate relative activities were derived and tabulated.

Experiments on the transport of auxin, F. W. WENT and R. WHITE (*Bot. Gaz., 100 (1939), No. 3, pp. 465–484, figs. 10*).—Adapting the photokymograph recording of the *Avena* test in a new technic, the results of H. G. van der Weij[4] were, in general, confirmed, as far as the transport properties of *Avena* coleoptiles are concerned. The velocity was independent of length of tissue, but the amount transported decreased with increased length of coleoptile section. Transport through the narrow or wide side of a coleoptile was practically the same, but the lower part had transport properties differing slightly from the more apical zones. The polarity of indoleacetic acid transport was far more pronounced than most of the earlier investigators found. In the present studies leakage along moist surfaces was more nearly excluded. Only the highest auxin concentrations (1,000 mg./l.) were transported from base toward top through 3.1 and 4.2 mm. sections, but not through 6.3 mm. coleoptile sections. There were great differences in transport rate among various growth substances. Owing to this and to differences in rate of growth reaction and limited transport capacity of the coleoptile cells, a wide variation resulted in the apparent growth activity of these substances in the *Avena* test. Indoleacetic acid transport

[4] Rec. Trav. Bot. Néerland., 29 (1932), pp. 379–496, figs. 26.

through other plant tissues was determined, with positive results for corn coleoptile, papaya leaf stalks and midribs, *Tropaeolum* leaf and flower stalks, and *Nitella* internodal cells.

Effect of indole-3-acetic acid on photosynthesis, N. G. CHOLODNY and A. G. GORBOVSKY (*Science, 90 (1939), No. 2324, p. 41*).—From the experiments with various plants (lilac, poplar, jasmine, hemp, hydrangea, etc.) briefly reported, it is concluded that indole-3-acetic acid causes a temporary intensification of photosynthesis on being directly introduced into the assimilating tissues of green leaves in very low concentrations.

Growth and metabolism of bean cuttings subsequent to rooting with indoleacetic acid, J. W. MITCHELL and N. W. STUART. (U. S. D. A.). (*Bot. Gaz., 100 (1939), No. 3, pp. 627–650, figs. 6*).—Treatment of kidney bean cuttings with 0.01 percent indoleacetic acid under the experimental conditions described significantly increased the weight of the hypocotyls and roots over those of controls until the thirteenth day after treatment. It also significantly decreased the growth of the first internode throughout the experiment, and also the growth of the tips. Even a strong solution (0.01 percent) did not appreciably affect the dry weight of the primary leaves. A weak solution (0.002 percent) caused slight responses qualitatively like the strong solutions. Neither strong nor weak treatment increased the weight of the whole plants above the controls. During rooting nitrogen was transported from the leaves to the first internodes and hypocotyls, the strong solution being by far the most effective in increasing the amount mobilized. This N was subsequently translocated to other parts of the cuttings. With the 0.01 percent solution a large amount of this mobilized N was temporarily deposited in the hypocotyls in insoluble form, but later was translocated to other parts of the cuttings. Since all this N later disappeared, it is deemed evident that the treatment stimulated the proteolytic enzyme activity of the cuttings. Applying nutrient solution after rooting increased the N content of the cuttings by ±35 percent. The larger number of roots induced by treatment resulted in the uptake of only a slightly larger amount of N and inorganic substances than were absorbed by the controls. Treatment with 0.002 percent acid resulted in slightly greater accumulation of sugars than in controls at the end of the experiment, while the 0.01 percent acid significantly reduced the sugar content of cuttings below that of controls at all times. No starch was present at any time in roots, leaves, or tips, and only traces in the hypocotyls and first internodes. Interpretation of the carbohydrate metabolism in relation to growth is said to require further information as to the effect of the acid on the rates of photosynthesis, respiration, and enzyme activity.

Effects of indoleacetic and naphthylacetic acids on development of buds and roots in horseradish, R. C. LINDNER (*Bot. Gaz., 100 (1939), No. 3, pp. 500–527, figs. 14*).—"In the young horseradish root, lateral roots develop from the pericycle or its derivatives, resulting in crushing of the endodermis. In the mature root, or transverse segments of it, buds originate in the region where the cambium of the upper root traces comes in contact with the phellogen. Roots originate from lower root traces in a similar manner. Derivatives of the cambium, phellogen, pericyclic parenchyma, phloem parenchyma, and xylem parenchyma may all be involved in the development of buds and roots. Occasionally a root may be formed from the lower cut surface without a root trace being involved. Application of relatively high concentrations of indoleacetic and naphthylacetic acids inhibits shoot production and stimulates root production. Under the influence of these compounds, roots are organized in the regions where buds would otherwise have organized. In addition, the mor-

phologically lower cut surfaces of the treated segments produce numerous roots from derivatives of the wound phellogen, phloem parenchyma, xylem parenchyma, and cambium. There is no root organization from the upper cut surface unless a lateral root trace is involved. Peripheral application of indoleacetic or naphthylacetic acid induces activity in the outer parenchymatous cells of the root, which culminates in the formation of new roots that soon perish. Placing the cut segments in running water for 24 hr. before treatment inhibits the production of callus and results in an increased invasion by micro-organisms. Various extracts of the horseradish plants were ineffective in the stimulation of the production of buds." There are 25 references.

Inhibition of the growth of buds of potato tubers with the vapor of the methyl ester of naphthaleneacetic acid, J. D. GUTHRIE (*Contrib. Boyce Thompson Inst., 10 (1939), No. 3, pp. 325–328, fig. 1*).—This ester inhibited the growth of potato tuber buds and was sufficiently volatile at room temperatures to be introduced as a vapor into intact tubers. Sprouting was retarded by storage in the presence of paper impregnated with the ester, and growth of the buds was inhibited by storage of tubers in a paper bag previously sprayed with it inside. This ester also induced epinasty of tomato leaves when a piece of filter paper containing a small amount was placed under a bell jar with the plant.

Studies in breaking the rest period of grass plants by treatments with potassium thiocyanate and in stimulating growth with artificial light, H. R. SHEPHERD. (Kans. State Col.). (*Kans. Acad. Sci. Trans., 41 (1938), pp. 139–153, figs. 9*).—Some sods of five midwestern grasses (*Bouteloua gracilis, B. curtipendula, Buchloe dactyloides, Agropyron smithii,* and *Andropogon furcatus*) were treated with potassium thiocyanate, some were subjected to outdoor freezing, and then some of each of these lots were given supplemental light in an attempt to break their rest periods and to stimulate growth. The rest periods of *Bouteloua gracilis* and *B. curtipendula* were effectively broken 21 days after the chemical treatment, and a slight response also occurred in *Andropogon furcatus,* the most effective concentration of the thiocyanate being a 0.1 percent solution. The rest period of *Buchloe dactyloides* was not broken by the chemical treatment. *Agropyron smithii* appeared to have no rest period. In most instances the grasses were stimulated to greater growth in height by the chemical and supplemental light treatments. In the majority of cases 2 and 1 percent concentrations of chemical killed the plants. Chemical treatment seemed to inhibit the flowering of *B. dactyloides,* while supplemental light was conducive to flowering in *Bouteloua gracilis.* All plants frozen out of doors began active growth 4 days after having been brought inside on December 30, and in nearly all cases they had made as much growth by the end of the experiment as had the treated plants.

Oxygen regulates the dormancy of the potato, N. C. THORNTON (*Contrib. Boyce Thompson Inst., 10 (1939), No. 3, pp. 339–361, figs. 4*).—It is reported that newly harvested potatoes will sprout in 7 days if held in 5–10 percent O_2 under moist conditions and in 9 days if held in 2 percent O_2 under dry conditions, but that sprouting will not occur until 47 days later if held in 20 percent O_2, an excessive amount. Moist conditions facilitate and dry conditions retard the formation of periderm. The detailed results obtained and the theoretical bases for them are fully discussed, and it is concluded that the experimental results and observations presented are contrary to the generally accepted theories regarding dormancy in newly harvested potatoes. It is shown that dormant potatoes fail to sprout because the bud tissue obtains too much O_2 rather than an insufficient supply, that the skin of young tubers is more rather than less

permeable to O_2, that the tuber skin becomes less rather than more permeable with age, and that peeling or otherwise wounding dormant tubers induces a condition retarding rather than facilitating the entrance of O_2. There are 14 references.

Cytology of dormancy in Phaseolus and Zea, F. G. Middendorf (*Bot. Gaz., 100 (1939), No. 3, pp. 485–499, figs. 19*).—Fixed in various fluids and stained by both iron hematoxylin and the Feulgen reaction, the cell in dormant seeds was plasmolyzed and the nucleus had an irregular form, apparently lacking membrane or limiting structure. The nucleolus was not optically differentiated by fixation, although it may stain intensely with iron hematoxylin. The vacuoles were small, and the mitochondria were small granules or spheres. At germination the cell became turgid, the nucleus regained a normal spherical form and the boundary became definite, and the nucleolus became optically differentiated even when unstained as by the Feulgen reaction, showing a vacuolate structure. The cytoplasmic vacuoles enlarged, and the mitochondria elongated into rods or filaments. Prior concepts regarding the chromatin of the dormant cell as having migrated centrifugally or centripetally are rejected on the basis of the Feulgen reaction. There are 24 references.

The use of indicator plants in locating seleniferous areas in western United States.—II, Correlation studies by States, O. A. Beath, C. S. Gilbert, and H. F. Eppson. (Wyo. Expt. Sta.). (*Amer. Jour. Bot., 26 (1939), No. 5, pp. 296–315, fig. 1*).—Continuing the investigation (E. S. R., 81, p. 354), this study of 563 specimens of native plants collected from 12 western States included the geographical location, geological formation and age of rock or soil on which the specimen was growing, stage of growth of the plant, part of the plant analyzed, and selenium concentration in parts per million. Special attention was accorded species of *Stanleya*, *Astragalus*, *Oonopsis*, and *Xylorrhiza*, the first two, because of wide distribution, proving especially valuable as indicators. Practically all specimens of *Stanleya* proved to be seleniferous, while the seleniferous species of *Astragalus* were restricted to 5 of the 29 groups of the Jones classification. These studies are believed to demonstrate that numerous geological formations from late Paleozoic to Quaternary can support native seleniferous plants, which are found rooted in both igneous and sedimentary rocks. The rocks include monozonite, limestones, and various shales. A number of geographical areas and geological formations not previously reported are considered. There are 22 references.

GENETICS

Breeding resistant races of crop plants [trans. title], E. Schiemann (*Chron. Bot., 5 (1939), No. 2–3, pp. 161–165*).—A review with citations.

The centromere, D. G. Catcheside (*Chron. Bot., 5 (1939), No. 2–3, pp. 160, 161*).—A description and discussion of the functions of this specialized particle in the chromosome which is said to determine not only normal chromosome movement but, through errors in its own division, may lead to the production of chromosomes having a new composition.

The nomenclature of hybrids, H. H. Allan (*Chron. Bot., 5 (1939), No. 2–3, pp. 205–209*).—A discussion of the international rules.

The nomenclature of hybrids, T. A. Sprague (*Chron. Bot., 5 (1939), No. 2–3, pp. 209–212*).—A discussion of the foregoing.

Reflections on the nomenclature of so-called hybrids, H. Uittien (*Chron. Bot., 5 (1939), No. 2–3, pp. 212–214*).—A discussion of the two foregoing.

Studies of inheritance in crosses between Bond, Avena byzantina, and varieties of A. sativa, H. K. Hayes, M. B. Moore, and E. C. Stakman (*Minne-*

sota Sta. Tech. Bul. 137 (1939), pp. 38, figs. 6).—Correlated studies were made on the manner of inheritance of characters differentiating varieties of *A. byzantina* and *A. sativa* and reaction of these oats varieties to stem rust, crown rust, and smuts. The material comprised crosses between Bond, *A. byzantina*, and several varieties of *A. sativa*, including Anthony, Iogold, Rainbow, and two selections called Double Cross A and Double Cross B, respectively, from previous crosses of (Minota×White Russian)×Black Mesdag.

Stem rust resistance was dominant to susceptibility, with a single factor difference indicated. Bond proved resistant to all physiological races of crown rust used. F_1 of all crosses proved resistant although lower in degree of resistance than Bond. F_2 of Bond×Rainbow approached a ratio of three resistant to one susceptible, indicating a single factor difference, while the other crosses gave segregations of nine resistant to seven susceptible, indicating two major factors for differentiation. Bond and the Double Crosses A and B proved resistant to the smuts in the field, the factor or factors conditioning resistance being unlike in Bond and Double Cross A. In crosses of Bond with Iogold and Anthony there were indications of a single major factor difference and some evidence of minor modifying factors. Previous studies indicated that at least two major factors were needed to explain resistance of the Black Mesdag type as exhibited in the double crosses used.

In mode of separation of the lower floret of the spikelet from the axis of the spikelet, the *A. sativa* type of abscission appeared dominant (3:1) over the *A. byzantina* type, designated as disarticulation, while the method of floret disjunction characterized by *A. byzantina* is dominant over the *A. sativa* type. Floret disjunction of *A. sativa* varieties usually showed disarticulation at the apex of the rachilla segment; the double crosses were characterized by heterofracture; and Bond showed disjunction by basifracture. Segregation in crosses between Bond and the double crosses was explained on the basis of a single major factor difference and more than one factor in the other crosses. Bond usually had a heavy growth of basal hairs on the lower floret, while the *A. sativa* varieties showed fewer or no basal hairs. *A. sativa* type of basal hairs behaved as a simple dominant over the Bond type. The type of segregation in awn development was strongly influenced by characteristics of the parents used in the crosses. Bond surpasses all other varieties in plumpness of seed, which could be transferred to plants typical of *A. sativa*.

Independence or association of characters in the F_2 generation of crosses was studied by means of χ_2 and P. One of the five crosses showed a negative association between degree of crown rust infection and plumpness of seed, and two crosses showed a similar association between plumpness of seed and degree of stem rust infection. Spikelet disarticulation was associated strongly with shattering of seed, with type of floret disjunction, and with type of basal hair development. Basal hair development was associated strongly with floret disjunction and awn development. Association between spikelet disarticulation and basal hair development was explained on the basis of genetic linkage with a cross-over value of 2.7±0.3. Indications were that it should be relatively easy to combine resistance to stem rust, crown rust, and the smuts with characters of cultivated varieties of *A. sativa* and with the plumpness of grain characterizing Bond oats.

Genetics of barley, D. W. ROBERTSON. (Colo. Expt. Sta.) (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 273–283, figs. 12*).—The linkage of characters in the common cultivated barleys, *Hordeum vulgare*, *H. intermedium*, *H. distichum*, and *H. deficiens*, all reported to have seven haploid chromosomes, are discussed with regard to the reported seven linkage groups, in which two or

more characters have been located. Short descriptions of some of the newer characters are given.

Mutants and linkage studies in Triticum monococcum and T. aegilopoides, L. Smith. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul. 298 (1939), pp. 26, figs. 22*).—Supplementing the information recorded earlier (E. S. R., 77, p. 316), descriptions are given for 56 viable mutants, mainly from X-rayed material. Absence of linkage was indicated by 97 combinations of factors, whereas 9 pairs of factors were linked, 4 (involving 6 genes) closely or completely.

Natural crossing in beans at different degrees of isolation, K. C. Barrons. (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 637–640*).—Preliminary experiments having shown 2.7 percent of natural crossing between bush varieties of common bean and 5.11 percent between pole varieties, strains of lima and common beans possessing contrasting characters were grown 1, 2, 3, 5, and 9 yd. apart. The percentages of natural crossing were 5.03, 2.51, 3.24, 2.27, and 1.10, respectively, in the lima varieties, and 8.26, 7.52, 4.9, 4.78, and 2.63 in the common bean. As a result, the author adopted the practice of isolating parental stocks by 50 yd. or more.

Immunity to Fusarium wilt in the tomato, G. W. Bohn and C. M. Tucker. (Univ. Mo.). (*Science, 89 (1939), No. 2322, pp. 603, 604*).—This preliminary statement reports that tests of several thousand plants in various progenies from crosses between an apparently immune Peruvian strain of *Lycopersicum pimpinellifolium* and several susceptible commercial tomato varieties prove that immunity to *F. lycopersici* in tomatoes depends on one dominant genetic factor. This factor was maintained in the heterozygous condition in a series of four backcrosses to susceptible varieties, and its potency was not decreased in the fourth backcrosses or their progenies. Large fruit size and other commercially valuable characters were obtained in some plants of advanced generations, and preliminary tests indicated that some plants in progenies from self-pollinated flowers of selections derived through outcrossing immune selections to commercial sorts for four generations were homozygous for immunity. Various lines are being tested and subjected to further selection.

Further data on breeding mosaic-escaping raspberries, C. D. Schwartze and G. A. Huber. (Wash. Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 647, 648*).—Further experimental data (E. S. R., 80, p. 504) indicated that the mosaic-escaping Lloyd George variety carries at least two genetic factors for resistance to the vector *Amphorophora rubi*, whereas plants that are somewhat resistant carry fewer resistance factors and susceptible ones are homozygous recessives.

The guinhen: Hybrid resulting from crossing a guinea hen and a male chicken, E. M. Funk. (Univ. Mo.). (*Amer. Poultry Jour., 69 (1938), No. 10, p. 16, figs. 4*).—Four hybrids between Pearl guinea hens and a Rhode Island Red rooster are described. The hybrids had yellow skin, the plumage showed some red color, and the combs were absent. Guinea shank color predominated.

Factors affecting fertility in Rhode Island Reds, F. A. Hays and R. Sanborn (*Massachusetts Sta. Bul. 359 (1939), pp. 15, fig. 1*).—Study was made of the effects of various factors on fertility in the Rhode Island Red flock from 1922 to 1936. Fertility rose with temperature variations until outside temperature was about 87° F. The fertility of both males and females declined with age, but males were mainly responsible for infertile matings. Variations in the number of females from 1 to 14 with which males were mated had no effect upon the fertility record. There was no correlation between fertility of dams and their daughters, suggesting that fertility was not heredi-

[ov]ary. However, the percentage of fertile matings within and between different families varied.

Growth of the hen's ovum, D. C. Warren and R. M. Conrad. (Kans. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 12, pp. 875–893, figs. 7*).—Ovum growth rate was studied by intravenous injections of Sudan III into Single Comb White Leghorns and Rhode Island Reds, and observations were made on 367 eggs laid. From the dye bands growth rate was ascertained and the comparative influences of rate of laying, clutch position, and other factors were determined. Growth was relatively constant as measured by radius increments from the ninth to the seventh day before ovulation but decreased rapidly thereafter, although some growth was detectable within an hour of ovulation. The first egg of the clutch may continue its growth slightly longer than successive eggs, but variations in yolk size and rate of ovulation were not conditioned by rate of ovum growth. The physiological basis for this is probably associated with factors controlling the initiation of the final stage of accelerated growth. Feeding excessive amounts of egg yolk stimulated rate of yolk secretion and increased the size of the mature ovum, but kamala feeding disturbed and checked the process of yolk secretion and thereby affected egg size.

Lactogen content of the anterior pituitary of growing rabbits and guinea pigs, S. Holst and C. W. Turner. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, *41* (*1939*), *No. 1, pp. 198–200*).—A comparison of the lactogen content in the anterior pituitary of mature females of different species showed the guinea pig to rank first with about 600 bird units per gram, the albino rat second with about 500 bird units, and the rabbit third with about 300 bird units. The lactogen content in the anterior pituitary of male rabbits was found to be very low and almost constant in all stages of growth and adult life, while that in the male guinea pig increased rapidly at puberty, exceeding the content of the mature nonlactating female of the species.

Skeletal changes and blood serum calcium level in pigeons receiving estrogens, C. A. Pfeiffer and W. U. Gardner (*Endocrinology*, *23* (*1938*), *No. 4, pp. 485–491, figs. 14*).—In studies at Yale University, daily injections of 1,000 International Units of oestrogen into pigeons caused a rise in serum calcium from a normal of 8 to 8.8 mg. per 100 cc. of serum to values ranging from 13.12 to 21.65 mg. Hypercalcification of the marrow-containing bones began about 2 weeks after such injections were started and reached a maximum after 5 weeks. Most of the new bone was endosteal.

***Hypercalcification, -calcemia, and -lipemia in chickens following administration of estrogens*, W. Landauer, C. A. Pfeiffer, W. U. Gardner, and E. B. Man.** ([Conn.] Storrs Expt. Sta. et al.). (*Soc. Expt. Biol. and Med. Proc.*, *41* (*1939*), *No. 1, pp. 80–82*).—In further studies, full-grown sexually mature cocks received daily injections of oestrogen ranging from 1,700 to 30,000 International Units. After 3 weeks' injection at the lower level a thin layer of newly deposited calcium was found on the endosteal surface of the bones. Higher levels resulted in more extreme bone changes and also a marked increase in serum calcium and serum lipids. Extreme lipemia occurred at the highest levels of injection.

Factors concerned in the duration of pregnancy, F. F. Snyder (*Physiol. Rev.*, *18* (*1938*), *No. 4, pp. 578–596*).—A review is presented of the hormonal and other factors inhibiting and inducing parturition, changes in the uterus during parturition, prolongation of pregnancy by prolongation of the activity of lutein tissue, and the role of the ovarian, pituitary, and placental hormones in the control of pregnancy in the ovarian cycle.

FIELD CROPS

Measuring crop yields on a community scale, F. S. Reynolds and A. E. Coldwell (*Jour. Amer. Soc. Agron., 30 (1938), No. 8, pp. 635–643*).—In a rapid method developed for measuring yields of grain sorghum, fields are divided into equal strips and yields are taken in sample areas spaced every 25 rows or equivalent distances through the center of the strips, and sorghum heads are counted and part weighed for estimation of yield on an acre basis. Yields so calculated were generally accurate to within 10 percent. On fields from 80 to 640 acres, one sample should represent not more than from 3 to 5 acres. One man can measure the yield on from 300 to 500 acres of grain sorghums a day. The method may be useful in evaluating such farm practices as furrowing, ridging, contouring, and terracing on ranch and farm lands.

[**Field crops research in Hawaii**], J. E. Welch, Sumida, W. W. Jones, G. K. Parris, J. H. Beaumont, M. Takahashi, J. C. Ripperton, E. K. Akamine, E. Y. Hosaka, and [L. D.] Whitney (*Hawaii Sta. Rpt. 1938, pp. 22, 24–27, 55–62, figs. 3*).—Further experimentation (E. S. R., 79, p. 469) with field crops, reported on briefly, including breeding, variety, cultural, storage, and spindling-sprout studies with potatoes; variety, spacing, and baking tests with sweetpotatoes; cutting and strain tests with Napier grass; germination, viability, and storage tests with crop seeds; a vegetational survey of pasture areas; and adaptation studies with grasses and clovers.

[**Field crops research in Idaho, 1938**]. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul. 229 (1939), pp. 15, 16, 17, 18, 35, 36, 37, 39–44*).—Brief reports of progress are again (E. S. R., 80, p. 36) made from experimentation at the station and substations, including breeding work with winter and spring wheat, oats, and *Phalaris tuberosa*; variety tests with winter and spring wheat, oats, barley, forage grasses, and pasture mixtures; modification of sprouting of potatoes by chemical treatments; effects of nurse crops with clover and alfalfa; effects of row spacing on seed yields of grasses and seed production tests; fertilizer trials with alfalfa, corn, barley, wheat, crested wheatgrass, and pasture; and control of bindweed by cultivation, competitive cropping, and sodium chlorate. New varieties released as results of breeding work included Idaed white spring wheat (the result of Sunset × Boadicea made by V. H. Florell), Lemhi (Federation × Dicklow) wheat, and Bannock (Markton × Victory) oats, and a perennial grass developed from Mosida winter wheat × native ryegrass (*Elymus condensatus*).

[**Crop research in Indiana**], J. T. Sullivan, H. R. Kraybill, C. B. Gustafson, G. P. Walker, R. R. Mulvey, G. H. Cutler, S. R. Miles, H. L. Cook, W. W. Worzella, C. E. Skiver, R. M. Caldwell, L. E. Compton, and A. T. Wiancko (*Indiana Sta. Rpt. 1938, pp. 11, 12, 28, 29, 30–33, 42, 88, 89, 90, 91, 92, figs. 3*).—Brief reports of progress are made from agronomic work (E. S. R., 79, p. 617) concerned with effects of fertilizer applications and other practices on kernel characteristics of winter wheat; manurial value of crop residues on Clermont silt loam; the effect of lime on inoculation and yield of soybeans on Alford silt loam; effects of side dressing corn with nitrogen; merits of the Richland soybean; corn varieties and hybrids for different soils; hilling v. drilling of fertilized corn; formaldehyde v. ethyl mercury phosphate seed treatments on oats yields; use of cyanamide for weed control; study of 11 characters of 30 varieties of soft and semihard wheat; technic for determining the fineness of wheat meal or granulation; wheat improvement in southwestern Indiana; inheritance of a lethal seeding character in common and durum wheat; soil fertility studies involving response of corn, wheat, soybeans, and clover in rota-

tions to fertilizers, lime, and manure; a comparison of clover, alfalfa, sweetclover, Korean lespedeza, and timothy in rotations with corn and wheat; an experiment with a 4-yr. rotation of corn, corn, soybeans, and potatoes to determine the need in well-disintegrated deep muck of the nonacid type for lime, phosphorus, and potassium; and an experiment on Crosby silty clay loam in a 3-yr. rotation of corn, wheat, and mixed hay to determine effects of lime, manure, and commercial fertilizers, and combinations of these upon soil fertility.

[Agronomic work by the Fruit and Truck Station] (*Louisiana Sta., Fruit and Truck Sta. Bien. Rpt. 1937-38, pp. 12, 13, 15-17, 19, 21*).—Variety tests with potatoes, winter legumes, and sugarcane; fertilizer and liming studies with potatoes, sweetpotatoes, lespedeza, and hairy vetch; plant production tests with sweetpotatoes; and inoculation studies with hairy vetch and soybeans are reviewed in brief progress reports. Pasture Improvement in the Florida Parishes, by R. H. Lush (p. 21), reports the response of different pasture clovers and grasses to different fertilizer treatments.

[Crops experiments at the North Louisiana Substation], S. STEWART and N. D. MORGAN (*Louisiana Sta., North Louisiana Sta. Bien. Rpt. 1937-38, pp. 3-22, 25-28*).—Average results are reported from experiments during varying periods with field crops at Calhoun (E. S. R., 77, p. 181), including variety tests with cotton, corn, cowpeas, soybeans, crotalaria, sugarcane for sirup, grain sorghum, potatoes, and sweetpotatoes; breeding work with cotton; fertilizer trials with cotton, corn, potatoes, and sweetpotatoes; seedbed preparation and planting tests with cotton and corn; spacing tests with corn and sweetpotatoes; comparisons of winter cover crops for cotton, corn, and sorghum for silage; effects of grazing by dairy cattle on production of different varieties of sweetpotatoes; a manured and fertilized rotation; a production test with alfalfa; and a trial of cornstalks and sugarcane bagasse as heating material for sweetpotato hotbeds.

[Experiments with rice and other crops in Louisiana, 1937-38], J. M. JENKINS. (Coop. U. S. D. A.). (*Louisiana Sta., Rice Sta. Bien. Rpt. 1937-38, pp. 4-17*).—Rice investigations (E. S. R., 77, p. 473), reported on briefly for 1937 and 1938, included variety, date of seeding with grain drill and in water, date and manner of submergence tests, rice rotations, fertilizer trials, and studies of the effect of holding water on rice lands in alternate years when not sown to rice. Progress in Improving Rice Varieties, a special article by N. E. Jodon (pp. 15-17), reviews breeding work. Experiments with other crops included variety tests with cotton, soybeans, grain sorghums, and sorgo; fertilizer tests with cotton; date of planting tests with corn, grain sorghums, and sorgo; different row widths for corn and cotton; a cotton and corn rotation; and a permanent pasture experiment.

[Field crops experiments in Nebraska]. (Partly coop. U. S. D. A.). (*Nebraska Sta. Rpt. [1938], pp. 19-30, 31, 32, 47, 48, 50, 51, 52, 53*).—Research with field crops (E. S. R., 79, p. 472) reported on from the station and substations included variety tests with winter and spring wheat, corn, oats, barley, grain sorghums, sorgo, alfalfa, sweetclover, soybeans, and Jerusalem-artichokes; breeding work with corn (and hybrids), sorghum, wheat, oats, barley, alfalfa, sweetclover, and potatoes; inheritance of green cotyledon color and dwarf branching habit in sweetclover; crop rotations; response of wheat, sorghum, and spring grains to fallow and other tillage practices; effects of manure and alfalfa on sugar beets and potatoes in rotations; storage and nutrition studies with potatoes; drying seed corn with heated air under forced draft; planting tests with corn, sorghum, and sugar beets; response of sorghum to length of day; cold resistance tests with strains of Argentine alfalfa; study of seed setting

in alfalfa; a clipping test and coumarin determination with sweetclover; surface v. furrow drilling of wheat, oats, and barley; plowing v. disking cornstalk land for oats and barley; production of foundation stocks of seed potatoes; growing crops with pump irrigation; pasturing of winter wheat at different degrees of severity; improvement of permanent pastures and meadows by improvement of species for reseeding; tests of forage species; response of grasses to intensity of clipping; a range survey in a sand hill area; and control of bindweed by cultivation and sodium chlorate.

Soil-conserving and soil-improving crop rotations for the Palouse, S. L. Sloan, A. W. Jacklin, and V. G. Kaiser (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 300–313, figs. 9*).—The problem of the introduction and establishment of soil-conserving and soil-improving crop rotations in the Palouse of eastern Washington and adjacent Idaho is discussed from findings on the demonstration project on the South Fork of the Palouse River. Two 6-yr. and one 4-yr. soil-improving rotations, planned for croplands having gently sloping and only moderately eroded soils, are designed to improve the physical condition of the soil and to increase or maintain the fertility and productiveness. Two 6-yr., one 7-yr., and one 9-yr. soil-conserving rotations, planned for use on the most severely eroded croplands and on the steeper slopes, provide an erosion-controlling cover on the land a major portion of the years in every cycle, improve the productivity and physical condition of the soil, and also provide protective vegetative cover.

Grasses of the Hawaiian ranges, L. D. Whitney, E. Y. Hosaka and J. C. Ripperton (*Hawaii Sta. Bul. 82 (1939), pp. 148, figs. 81*).—The technical and popular descriptions of 103 of the most important grasses in Hawaii, presented with illustrations, show the characteristics, origin, value in native land, occurrence in Hawaii, nature of growth, and value on the range. Very few of the native species are common on the range, the introduced species being far more important in point of number and of forage value. Appropriate keys to the tribes and genera are included, together with a list giving botanical and common names, native countries and dates of introduction of species, a glossary, and an index.

Susceptibility of seedling grasses to damage by grasshoppers, W. Hermann and R. Eslick. (Wash. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 333–337*).—Species of grasses varied significantly in 1938 in susceptibility to grasshopper attacks of four grasshoppers at Pullman, Wash. *Bromus mollis*, *Deschampsia elongata*, *Festuca idahoensis*, *F. ovina*, and *F. rubra* var. *commutata* displayed complete defoliation. *Agropyron cristatum*, *A. elongatum*, *A. repens*, *A. subsecundum*, *Arrhenatherum elatius*, *Dactylis glomerata*, *Elymus glaucus*, *F. elatior*, *Hordeum bulbosum*, and *Poa secunda* showed an average of between 80 and 100 percent defoliation by grasshoppers. *Agropyron smithii*, *B. inermis*, *E. canadensis*, and *Phalaris arundinacea* suffered an average damage of less than 20 percent for each species. Other species were intermediate in susceptibility to grasshopper damage. Among species, growth habit, i. e., winter—entirely vegetative, or spring—first-year flowering, had slight influence upon respective susceptibilities, but within a species selections with winter habit of growth showed a greater susceptibility toward grasshopper damage than those with spring habit. Selections within each species differed widely in comparative susceptibility to damage by grasshoppers. The extreme differences observed between seedling grasses in resistance to attacks by grasshoppers may indicate a greater ease of establishment of some species of grass than of others in areas where the insects are numerous enough to do considerable damage without completely destroying the plants.

A short bibliography on grasses, grasslands, and fodders in India (*Agr. and Livestock in India, 9 (1939), No. 3, pp. 290–300*).—The list includes 190 references.

Perfect-flowered buffalo grass (Buchloe dactyloides), R. L. Hensel (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 12, pp. 1043, 1044, figs. 2*).—Plants were found which produced perfect flowers on what was normally the staminate inflorescence. Several matured florets from these plants produced apparently fully developed caryopses, though much smaller than normal seed produced by the female plant. The pollen was demonstrated to be functional by normal seeds obtained from crosses in which the perfect-flowered plant served as the pollen parent.

Some factors affecting the prevalence of white clover in grassland, B. A. Brown. ([Conn.] Storrs Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 322–332*).—Over 3 yr., strains of clover indigenous in old pastures of England, New Zealand, and the United States have maintained the best stands in grass-clover seedings, while Polish, Danish, and commercial white Dutch were the shortest lived. As to longevity, little choice appeared between seed from northern, southern, or far western parts of the United States. Climatic conditions were less important than fertilization or species of grasses in maintaining white clover in mixed stands. Clover was much less prevalent with turf-forming grasses, as bluegrasses and bents, than with species having more open stands.

Retarding effects of nitrogenous fertilizers on clover in grassland were due chiefly to increased grass competition caused by nitrogen. In grazed permanent pastures, very little clover has been present without addition of phosphorus. Pastures with complete minerals (PLK) had the most clover, but omission of K had little effect. On an adjacent permanent meadow mowed in June for hay and grazed in late summer and fall, either potassium or manure added with superphosphate and limestone was very effective in promoting large amounts of clover. On Charlton fine sandy loam soil, minor elements have had no appreciable effects on clover. Lawnmowing to ½ in. (v. 1 in.) for one season greatly decreased both Ladino and Kent clovers in Kentucky bluegrass-clover seedings, but Kent clover increased slightly under this management in mixture with less bluegrass. Amounts of volunteer white clover increased with height when vegetation was mowed during 4 yr. under different methods of fertilizing Kentucky bluegrass and Rhode Island bentgrasses cut when 2, 3, 4, and 5 in. high.

Tests of corn varieties and hybrids in Utah, R. W. Woodward, D. C. Tingey, and R. J. Evans. (Coop. U. S. D. A.). (*Utah Sta. Bul. 287 (1939), pp. 32*).—Variety tests in different localities in the State with corn for grain, 1931–36, and silage, 1934–38, suggest for sections with an average growing season U. S. Hybrid 52 (Ohio Hybrid C72), with a long growing season Reid Yellow dent, and for sections with short seasons (95–105 days) Will Allen, Canadian flint, or certain early strains of Minnesota 13. Ohio Hybrid W63 also was found superior in yield to standard varieties for the main agricultural areas of the State. Wide variations in yield and other agronomic characters were observed among strains of Minnesota 13 and its derivative Colorado 13. See also a previous note (E. S. R., 61, p. 633).

Effect of nitrogen, phosphorus, and potassium in fertilizers on the earliness of cotton, H. B. Brown and H. W. Pope (*Louisiana Sta. Bul. 306 (1939), pp. 15, figs. 11*).—The effect of each of three nutrient elements on earliness of cotton was studied, 1927–31, in connection with fertilizer tests noted earlier (E. S. R., 80, p. 595).

Cotton receiving heavy applications of phosphorus produced higher percentages of seed cotton at first picking, had a higher blooming rate in the first 2 weeks of the blooming period, and resulted in higher yields of seed cotton than cotton receiving no phosphorus (NK) or no fertilizer. Plats heavily fertilized with nitrogen did not differ much from no nitrogen (PK) or no fertilizer plats in earliness or rate of blooming, but were consistently higher in yield. Potassium seemed to retard boll opening as compared with no potassium (NP) or no fertilizer, was similar in blooming rate, and greatly outyielded these plats in order.

When the three elements were heavily applied respectively in complete fertilizers, cotton receiving the heavy application of phosphorus was outstanding in blooming rate during the first 4 weeks and very little behind in the fifth week. Plats receiving heavy applications of nitrogen or potassium, not significantly different from each other, were intermediate between the unfertilized and the heavy phosphorus plats in blooming rate. Over the period, fertilized plats showed an upward trend without differing greatly, although cotton receiving heavy potassium treatment seemed outstanding in 3 of 5 yr. Unfertilized plats showed a downward trend in yield. A heavy rate of blooming as indicated by the phosphorus curve did not necessarily mean high yields.

Relation of the structure of the chalazal portion of the cotton seed coat to rupture during ginning, N. L. Pearson. (U. S. D. A. and S. C. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 11, pp. 865–873, pls. 3, figs. 2*).—Material representing different stages in the development of the seeds of Super Seven and Acala (*Gossypium hirsutum*) and Pima (*G. barbadense*) cottons showed that the chalazal part of the seed coat has a very characteristic structure. The palisade layer ends at the point of attachment of the inner integument to the chalaza, and thus a small opening, left in the palisade layer, is nearly filled with a fairly compact mass of undifferentiated cells, the chalazal plug. The inner and especially the outer pigment layers are thicker in the chalazal region than elsewhere on the seed and are spongy in nature. In chalazal chipping, the main rupture occurs in the spongy tissue—either above or below the vascular strands. The broken areas vary in size in different seeds but usually include a part of the spongy tissue very close to or over the chalazal plug. This outer spongy tissue constitutes a weak place in the seed coat, and its existence furnishes one explanation for the chipping of cotton seeds at the chalazal end during ginning, which adds undesirable foreign matter to the ginned lint.

Limesone mobilizes phosphates into Korean lespedeza, W. A. Albrecht and A. W. Klemme. (Mo. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 4, pp. 284–286, fig. 1*).—Korean lespedeza grown on Putnam silt loam in 1938 responded to phosphates alone and especially with limestone in increased crop and nitrogen harvest. The use of these materials together also served to mobilize the phosphorus into the crop more effectively for an increase in the total crop harvest and in its relative content of protein.

Potato culture and storage investigations in 1937 and 1938, E. V. Hardenburg. (Cornell Univ.). (*Amer. Potato Jour.*, *16* (*1939*), *No. 6, pp. 143–150*).—Recent research on potato culture and storage is reviewed, with a list of 42 references.

Soybeans: Their effect on soil productivity, O. H. Sears (*Illinois Sta. Bul. 456* (*1939*), *pp. 545–571, figs. 10*).—Soybeans, whether used for hay to be fed on the farm or sold, for grain to be sold and straw returned to the land, or for green manure, are discussed as to their effects on soil tilth and tendency toward erosion, on activity of soil bacteria, on plant-food balance, and on other crops in the rotation. Conclusions from the report, which is based largely on

experiments at this and other experiment stations, may be summarized as follows:

Soybeans, to fit most usefully into Illinois cropping systems, must be handled so as to contribute to soil conservation and not to soil depletion. Best control of erosion where soybeans are grown on rolling land is secured by drilling solid and following with a winter cover of drilled small grain, both crops on the contour. Where soybeans are drilled solid up and down the slope, erosion losses usually are reduced about half. As many weeds as possible should be killed before and shortly after seeding. Introduction of a high-yielding, early-maturing soybean which can be harvested early enough for wheat to be sown afterward at the normal time is a desirable objective.

Part of the soybean tops must be returned in some form to the soil or nitrogen will be depleted. Combining the beans and leaving the straw on the land may result in a slight increase in soil nitrogen if it is not leached before used by the next crop. As green manure soybeans supply organic matter containing from 60 to 100 lb. of nitrogen an acre, but the relatively high cost usually is a drawback to this practice. Soybeans should be considered primarily as a cash or feed crop, and other legumes, such as sweetclover, red clover, and alfalfa, used for soil improvement. Since on many less fertile soils soybeans can use nutrient elements not available to many other crops, these mineral elements should be returned by fertilization to maintain soil productivity at a satisfactory level. Where winter grain is sown on rolling land on the contour after soybeans are harvested, as indicated above, on most soils a phosphatic fertilizer should be applied. On land not subject to serious erosion, the spring-planted oats and corn generally do better after soybeans than do fall-sown crops without fertilizer.

Soybean production in Kansas, J. W. Zahnley *(Kansas Sta. Bul. 282 (1939), pp. 28, figs. 7)*.—A revision of Bulletin 249 (E. S. R., 63, p. 441) is presented. Varieties currently regarded as desirable on the basis of station tests, 1930–37, are Hongkong, A. K., and Selection 6 (from A. K.) for general use for seed and also good hay producers, and Pinpu, Manchu, and Illini where an earlier variety is wanted. Laredo is regarded as the leading hay variety for Kansas. Hongkong, A. K., and Laredo led in average seed yields in tests in southeastern Kansas, 1924–27, and Laredo was first in hay production.

Growing sweetpotatoes in the Yazoo-Mississippi Delta, E. A. Currey *(Mississippi Sta. Bul. 327 (1939), pp. 14, figs. 5)*.—Practical suggestions derived from extensive studies of fertilizers, varieties, and curing and storage at the Delta Substation include the choice of a light, well-drained, sandy loam or loam with clay subsoil; fertilization with from 125 to 250 lb. per acre of a nitrogen carrier providing from 20 to 40 lb. of nitrogen per acre applied under the rows at bedding and preferably 2 weeks or longer before setting plants; the Porto Rico variety; use of about 8 bu. of seed roots in a manure- or flue-heated hotbed to provide plants enough for an acre; planting on beds in rows 36 in. wide and plants 12 in. apart; cultivating enough to keep the soil free from grass and weeds; and careful harvesting and handling and field grading. The sweetpotatoes should be placed in a curing house within a few hours after digging and kept for 10 days at from 80° to 85° F. and relative humidity of 90 percent. The temperature should then be reduced gradually and maintained at about 55° throughout storage.

The information, except for fertilizers, also applies to other parts of Mississippi. For the hill sections the station recommends the use of from 500 to 1,000 lb. per acre of 4–8–4, 6–8–4, or 6–8–8 fertilizer, according to the fertility needs of the different soils.

Growing wheat in the eastern United States, S. C. SALMON and J. W. TAYLOR (*U. S. Dept. Agr., Farmers' Bul. 1817 (1939), pp. [2]+59, figs. 52*).—Wheat varieties and their distribution and adaptations, cultural and field methods, and harvesting and threshing practices are described, and information is given on the status of the crop, its climatic and soil needs, and control of diseases and insects. Weed control is described in Weeds in Wheat, by L. W. Kephart (pp. 54, 55). This publication is a revision of and supersedes Farmers' Bulletins 596 (E. S. R., 31, p. 438), 616 (E. S. R., 32, p. 336), 885 (E. S. R., 38, p. 240), 1168 (E. S. R., 45, p. 133), and 1305 (E. S. R., 48, p. 835).

Commercial agricultural seeds, 1938, G. P. STEINBAUER (*Maine Sta. Off. Insp. 170 (1938), pp. 91–119*).—The purity, germination, hard seed content (in legume seed), and noxious weeds, where present, are tabulated for 190 samples of agricultural seed collected from dealers in Maine in 1938.

The soil moisture relationship of European bindweed growing in corn, A. L. BAKKE. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 352–357, figs. 3*).—Soil samples taken at 1- and 2-ft. depths from cornland heavily infested with bindweed and from soil free of the weed during the summer months of 1933, 1934, and 1935 did not differ markedly in soil moisture content. Bindweed could maintain itself when the moisture content was below the wilting coefficient, probably due to the deeply penetrating root system, but corn did not compete successfully near the wilting coefficient. Corn grown in 1933 on a heavily infested area kept free of bindweed by weekly hoeing produced twice as many pounds of corn as a control area receiving three cultivations.

Dodder control in annual lespedezas, R. E. STITT. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 338–343*).—The life history of field dodder (*Cuscuta pentagona*) on annual lespedeza is given in brief, with a list of crops and weeds observed as host plants and accounts of seed cleaning and control experiments.

Germination under field conditions occurs throughout the growing season. Growth is rapid and blossoms were found 21 days after attachment to the host. Seed of field dodder could not be removed entirely from annual lespedeza seed by screens. Dodder growing in the field could be destroyed by several methods, e. g., burned with a blowtorch, cut out by hand, or sprayed with chemicals. The most economical will depend on labor and material costs. Effective chemicals tested included a 2.5-percent solution by weight of sulfuric acid with water, ammonium thiocyanate 1 lb. in 2 gal. of water, and "Atlacide" 1½ lbs. in 1 gal. of water, all of which killed all plants of both dodder and lespedeza when thoroughly moistened by spraying. Spraying with chemicals does not prevent production of dodder seed if seed balls have begun to form.

HORTICULTURE

[Horticultural studies by the Hawaii Station], W. B. STOREY, W. W. JONES, M. E. HARTUNG, J. H. BEAUMONT, [B. J.] COOIL, P. GUEST, [H.] KUBOTA, J. E. WELCH, SUMIDA, L. A. DEAN, and R. YOSHIDA (*Hawaii Sta. Rpt. 1938, pp. 11–22, 23, 27–30, 45–47, 54, 55, figs. 3*).—Included are brief progress reports on the following studies: Genetics, breeding and selection, and sterilization and storage of papaya; morphology, breeding, culture, growth habits, oil storage, and chlorosis of the macadamia nut; culture and pruning of coffee; composition and storage of the mango; growing of truck crops; composition of coffee trees as affected by fertilization; quality in coffee; and breeding and selection of sweet corn.

[Horticultural studies by the Indiana Station], O. W. FORD, D. M. DOTY, J. R. ROACH, C. E. BAKER, J. A. MCCLINTOCK, C. L. BURKHOLDER, T. E. HIENTON,

E. C. STAIR, J. D. HARTMAN, F. C. GAYLORD, K. I. FAWCETT, E. R. HONEYWELL, J. E. DICKERSON, N. K. ELLIS, and J. P. BIEBEL (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1938, pp. 10, 12, 70–74, 75–79, figs. 4*).—Among studies the progress of which is discussed are spray residue removal, inbreeding of sweet corn, orchard soil management and cover crops, apple propagation and spraying, varieties of peaches and plums, storage of apples, production of tomato seed, fertilizer and cultural studies with the tomato, the marketing of fruits and vegetables, grading and marketing of peonies, quality of canned tomatoes, production of muck and sandy soil crops, use of supplemental light in the greenhouse, and the growing of pyrethrum for insecticidal purposes.

[**Horticultural studies by the Fruit and Truck Experiment Station**], W. F. WILSON, JR., J. C. MILLER, and W. D. KIMBROUGH (*Louisiana Sta., Fruit and Truck Sta. Bien. Rpt. 1937–38, pp. 1–12, 14, 15, 18, 19, 20*).—Included are reports on the results of studies on the fertilizer and cultural requirements of the strawberry; yield of fruit from plants produced at different times; effect of lime on strawberry yields and plant production; mulching of the strawberry; effect of source of plants; fertilizer and lime requirements of the pepper, bean, cucumber, and cabbage; growing of tung trees, mayhaws, and vetiver; fertilizer for the Satsuma orange; improvement of the blueberry; and variety tests of grapes, pecans, and various bush fruits.

[**Horticultural studies by the North Louisiana Substation**], N. D. MORGAN (*Louisiana Sta., North Louisiana Sta. Bien. Rpt. 1937–38, pp. 22–25, 28, 29*).—Brief reports are offered on variety and fertilizer tests with tomatoes and watermelons and varieties of peaches, apples, and pecans.

[**Horticultural studies by the Nebraska Station**] (*Nebraska Sta. Rpt. [1938], pp. 30, 49*).—Contained are progress reports on the following studies: Cultural requirements of orchard trees and grapevines; irrigation of orchards; and yield tests of sweet corn, tomatoes, and onions.

Effect of storage, bulb size, spacing, and time of planting on production of onion seed, H. A. JONES and S. L. EMSWELLER (*California Sta. Bul. 628 (1939), pp. 14, figs. 2*).—Using a strain of Ebenezer onion known to have produced poor crops of seed in some years, mother bulbs were placed, after harvest, in six storage conditions, namely 38.5°, 46.5°, 53.5°, and 86° F. constant temperatures, in a basement room at from 61° to 71.5°, and in a warehouse where the temperature and relative humidity fluctuated with the weather. In early December the bulbs were removed and set in the field. Plants from bulbs stored at 46.5° and 53.5° were always first to bloom and to mature seed. The 86° bulbs were latest to bloom and mature seed. Bulbs held at 53.5° produced the largest number and those at 86° the smallest number of seed heads. The mean yield of seed was highest from the 53.5° plats, but was not significantly above the 46.5° plats. The 86° bulbs produced the least seed. Both high and low storage temperatures depressed seed yields.

Later studies with a free-seeding strain of Ebenezer, Yellow Globe Danvers, and a strain thereof showed comparable results, although the several varieties did not respond in the same manner to the different storage conditions. In a comparison of eight sizes of mother bulbs of Yellow Globe Danvers ranging in weight from 15 to 90 gm., there was observed an increase in the number of seed heads per plant, seed yield per plant, and seed yield per acre as bulb size increased. In the case of Yellow Globe Danvers bulbs set 3, 4, 6, 8, and 12 in. apart in the row, a significant increase in seed yield per plant followed each increment, but the total yield per acre was decreased. With Yellow Globe Danvers bulbs set in the field at different dates from December 7 to March 2, there was, in general, a decrease in seed yield as the planting was delayed. Late setting caused late blooming and greater opportunity for thrips injury.

Classification of tomato varieties according to physiological response, V. A. TIEDJENS and L. G. SCHERMERHORN. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 737–739*).—Pritchard, Bonny Best, Globe, Marglobe, and Rutgers tomato plants grown at six different root temperatures—55°, 60°, 65° 70°, 80°, and 90° F.—with air temperatures approximately 58° at night and 78° during the day made their best growth in the range between 65° and 80°. Varieties with a high rate of metabolism, such as Rutgers, made the greatest response to low temperatures and were most adversely affected by high temperatures. When root temperature was high enough to inhibit fruit set in Rutgers, the starch present in the afternoon disappeared completely during the night and was absent from the pollen grains. In contrast, pollen grains of plants that set freely always gave a positive reaction for starch. Suggestions as to the differential fertilizer requirements of various varieties are presented.

Experiments on tomato plants and planting methods, Pennsylvania State College, 1938, W. B. MACK (*Canning Age, 20 (1939), No. 6, pp. 243, 244*).—Based on the yields of randomized, replicated plats, no significant differences were found except in one case (which could be explained by the condition of the plants at time of setting) in total yield of Rutgers tomato plants secured from 16 different sources including the Southern States. With respect to early yield during the first 3 weeks, two lots, one from a certified southern source and one cold-frame spotted source, were definitely superior and three were definitely lower. In a study of the effect of nutrients applied to Rutgers plants at the time of setting, no treatment was significantly better than water alone with respect to total yields, but two P treatments did increase early yields significantly.

Some effects of potassium and nitrogen on the composition of the tomato plant, T. G. PHILLIPS, T. O. SMITH, and J. R. HEPLER (*New Hampshire Sta. Tech. Bul. 73 (1939), pp. 11*).—Observations on the chemical composition of Sunrise tomato plants grown in sand, with and without external supplies of K and on different N levels, showed, at the point where K deficiency became evident, certain well-defined effects of the variation in the N supply on K assimilation. In plants grown with very high N, the ash in percentage of dry weight was uniformly lower in the plants without K than in those with K. At the lower level of N supply, the percentage of K in the ash was increased. At the high N levels a lack of K was decidedly depressing on growth, whereas at a very low N level K deficiency actually improved growth slightly. At a low N level, starch was more abundant in the stems of the −K than in the +K plants. No striking evidence was found for K deficiency to produce abnormalities in N metabolism. The results supported the hypothesis that a balance between K and N is important in the growth of plants.

The fundamentals of fruit production, V. R. GARDNER, F. C. BRADFORD, and H. D. HOOKER, JR. (*New York and London: McGraw-Hill Book Co., 1939, 2. ed., pp. XVI+788, pls. 3, figs. 76*).—This is the second and revised edition (E. S. R., 47, p. 237).

Pollen longevity studies with deciduous fruits, J. R. KING and C. O. HESSE (Univ. Calif. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 310–313*).—In studies with varieties in the genera *Prunus*, *Pyrus*, *Cydonia*, and *Pistachia*, it was found that air-dried pollen, stored in vials and placed in sealed fruit jars, could be kept alive for at least 550 days under favorable conditions. In general, the optimum storage for most of the pollens tested was about 36° F. and 25 percent relative humidity. Pollens stored at 10° reacted very similarly to those stored at 0 percent relative humidity within the favorable temperature range.

Cytological and morphological features associated with impotency of pollen of the Winesap apple, J. N. MARTIN. (Iowa State Col.). (*Iowa State Col. Jour. Sci., 12 (1938), No. 3, pp. 397–404, pl. 1*).—Pollen abortion in the Winesap apple is believed to be associated with abnormal development of tapetal tissue and pollen-sac wall cells. Tapetal tissue, instead of diminishing, continues its development to the extent that it crowds in upon the pollen and, in extreme cases, practically fills the locule, leaving little room for pollen development. In such cases, the pollen shows evidence of abortion in lack of density and a vacuolated condition of the protoplasm and ultimate shriveling and disorganization. Apparently, pollen abortion in the Winesap is the result of a reversal in physiological relationships in which the tapetal cells digest the pollen.

Incompatibility of Early McIntosh and Cortland apples, W. WEEKS and L. P. LATIMER. (Univ. N. H.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 284–286; also New Hampshire Sta. Sci. Contrib. 67 [1939], pp. 284–286*).—Continuing these studies (E. S. R., 78, p. 49), the authors report that cross compatibility exists between McIntosh and its seedlings Melba, Milton, Cortland, Macoun, and Early McIntosh. However, in the Cortland × Early McIntosh there was definite indication of cross incompatibility. Examination of the styles of Cortland × Early McIntosh and vice versa showed no pollen tubes to have progressed more than one-fourth the way down the style. At the end of 24 hr., tubes ceased growth, and by the end of 48 hr. had swollen tips. In selfed Early McIntosh, tubes grew one-third the way down the style. On the other hand, in McIntosh × Early McIntosh and Cortland × McIntosh, pollen tubes grew steadily until the ovaries were reached. King, a triploid, proved of little or no value as a pollinizer for any of the McIntosh group.

An evaluation of ninety-six apple varieties at the 21-year period under Illinois conditions, R. L. MCMUNN. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 379–383*).—Data are presented on the age of initial bearing, yields, susceptibility to fire blight, winter injury, etc.

Seasonal variation of oxygen and carbon dioxide in three different orchard soils during 1938 and its possible significance, D. BOYNTON and W. REUTHER. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 1–6, figs. 2*).—Of three subsoils—sandy loam, light silty clay loam, and silty clay—the atmospheres of which were studied from November 1937 to October 1938, only the sandy loam maintained high percentages of O_2 throughout both dormant and growing seasons at all depths down to 6 ft. In all three soils the percentage of O_2 decreased as the depth of sampling increased. In the silty clay it was impossible to obtain any gas samples between November 27 and June 14. Since the summer of 1938 was dry, it appeared likely that the differences in O_2 level were less and the duration of the period of aerobic conditions longer than would occur in normal or in wet seasons. In the heavier soils it was evident that the roots in the deeper levels were inactive during a considerable portion of the year.

Contour planting and terracing as a basis for soil and water conservation in orchards, J. T. BREGGER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 7–12*).—Tracing the history of contour planting of orchards, the author discusses types of orchard terraces, auxiliary erosion control practices (such as cover cropping and mulching), and effect of contour planting, and points out needed research. Four years' records obtained in a 25-percent slope vineyard at Hammondsport, N. Y., showed material increase in yield and decrease in water and soil losses on the countour plan as compared with up-and-down cultivation.

Phosphorus and potassium as supplements to nitrogen in sod mulch orchards in New Hampshire, G. F. Potter and E. G. Fisher. (N. H. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 41–44; also New Hampshire Sta. Sci. Contrib. 69 [1939], pp. 41–44*).—Comparisons in three orchards of different N fertilizers with commercial complete fertilizers applied in equal quantities with respect to the amount of actual N failed to show any response to the complete material which would justify its use. In one orchard, color was significantly better on the complete plats, but the yields were less. Growth of mulch was better in one case where the complete fertilizer was used.

Experimental production of winter injury to the trunks of apple trees by applying nitrogenous fertilizers in the autumn, M. A. Tingley, W. W. Smith, T. G. Phillips, and G. F. Potter. (Univ. N. H.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 177–180; also New Hampshire Sta. Sci. Contrib. 71 [1939], pp. 177–180*).—Of young Baldwin trees fertilized at four different dates during the autumn of 1936 with different N materials, only those treated on October 14 developed injury of the type described previously (E. S. R., 78, p. 49). Treatment of mature trees with cyanamide failed to result in any injury, although chemical analysis showed an appreciable increase in the total and soluble N contents in the roots, but none in the bark of the trunk or limbs. Mature McIntosh trees which had produced heavily in 1937 were fertilized that autumn with from 4 to 50 lb. of cyanamide or ammonium sulfate per tree. Despite the fact that neither artificial freezing, chemical analysis, nor the microscope revealed any change in the trunk tissue, it was observed in collecting January samples that the bark did not adhere to the wood in certain trees which had been fertilized with large amounts of ammonium sulfate. By February 3, a discoloration was noted in the region near the cambium which became progressively more evident. At the same time, trees receiving no fertilizer or smaller amounts of fertilizer were not affected. The indications were that available N applied in large amounts in autumn was concerned with the injury.

Anatomical studies of root and shoot primordia in 1-year apple roots, E. A. Siegler and J. J. Bowman. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *58 (1939), No. 11, pp. 795–803, pls. 11*).—Observations were made on seedlings and named varieties in an attempt to relate vegetative responses with anatomical features. Limited experiments with clonal material indicate that successful propagation of apple root cuttings is dependent upon the ability of the cutting to push roots either in advance of, or concurrently with, shoots. Anatomical studies indicate that adventive shoot primordia are generally more completely organized than adventive root primordia. This condition probably accounts for the relatively quick emergence of shoots in certain clons before adequate roots are developed. Adventive primordia originate in tissues that have made considerable secondary growth. In general, root primordia are initiated in close association with the vascular cambium, and shoot primordia are organized as a result of activity of a small group of ray parenchyma cells near the periphery accompanied by divisions in the posterior regions.

The effect of a plant growth substance on crotch angles in young apple trees, L. Verner. (Idaho Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 415–422, figs. 2; abs. in Idaho Sta. Bul. 229 (1939), pp. 18, 19*).—Working with yearling trees of Yellow Transparent, Delicious, and Jonathan apples, the author observed that injury, as by girdling, to the phloem immediately above a dormant bud invariably resulted in the development of a narrow-angled branch issuing from the bud. The assumption was that wide-angled crotches result from the action of a plant hormone formed in the growing tips of the

plant and passed downward through the phloem. When indolebutyric acid in lanolin paste was applied to the upper surface of the basal internode of a young shoot while the internode was still elongating, a marked increase was observed in the angle formed by the shoot and the trunk. After elongation had ceased and the tissues had hardened, neither girdling nor auxin treatment influenced the crotch angle. By permitting indolebutyric acid to diffuse slowly into the cut end of dormant whips that had been headed to about 30 in., it was possible to cause abnormally wide angles throughout the entire tree.

Apple thinning.—I, An analysis of bloom; II, The relation of thinning to size and the off year, M. J. Dorsey. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 72 (1938), pp. 410–415; 472–478*).—Apple varieties differ with respect to the age of initiating fruit bearing, time of bloom, and manner of bearing. Hence there is a need of different pruning and thinning treatments. Varieties that bloom early are much more subject to frost injury than to unfavorable pollination conditions. An average bloom, in which from one-third to one-half the spurs produce flowers, is more desirable than a heavy bloom because in the moderate-blooming trees there will be a considerable percentage of spurs free to develop fruit buds for the succeeding year. In any given season there was a fairly close relationship between the extent of bloom and total yield. There was a definite tendency for apple trees to produce an enormous excess of blooms.

Various causes, such as complete blossom kill by low temperature, defoliation by scab, and a series of heavy crops, are known to upset regular fruiting in apple trees. Thinning of fruit affects the size of individuals and may aid in maintaining regular bearing. Thinning may be employed to improve the immediate crop, to prevent young trees from overbearing and going into an alternate status, and to restore regular fruiting after alternate bearing has been established. Thinning should be timed to begin after the natural drops.

Relation of seeds to pre-harvest McIntosh drop, L. Southwick. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 410–412*).—There was noted a moderate but significant correlation between seed number and time of preharvest dropping in the McIntosh apple. Seed content varied widely among trees, probably as a result of variability in the effectiveness of pollination, but this did not seem to alter appreciably its association with the date of drop.

Farm storages for New England apples, C. I. Gunness, W. R. Cole, and O. C. Roberts (*Massachusetts Sta. Bul. 360 (1939), pp. 32, figs. 16*).—Devoted for the most part to providing general information on the design and structure of storage buildings, refrigeration equipment and operation, management of storage houses, physiology and handling of fruit, temperature and relative humidity control, etc., this bulletin presents certain research results. McIntosh apples held at 45° F. during the 10-day harvesting period, and for 5 days later, developed their maximum quality; but when fruit was to be kept later than January 1, it was necessary to place it immediately in 32° storage. Although a high relative humidity (about 85 percent) is desirable, experiments showed that lower relative humidity during harvesting and storing is not essentially harmful.

Temperature in relation to peach production in Illinois, R. L. McMunn. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 72 (1938), pp. 221–234, fig. 1*).—A study of data reported in journals, U. S. D. A. Weather Bureau records, etc., showed 11 winters in the 105 yr. covered in which severe tree injury and complete loss of crops had occurred over the entire peach-producing area of Illinois. There was no regular sequence of disastrous years. Injury to trees did not usually occur until the temperature reached −10° F. or lower, but sometimes took place at somewhat higher temperatures. Generally, there was some killing

of fruit buds when the temperature reached 0°, but it was found to occur at temperatures as high as 10°. There were 27 yr. in the northern part of Illinois and 21 yr. in the southern when the fruit buds were all killed. Considerable difference was found in bud survival in different varieties in a given season and in a single variety in different seasons. Losses due to spring freezes were greater in the northern than in the southern limits, suggesting the possibility that from the standpoint of present varieties the peach is grown too far north in Illinois.

Hardy peach varieties, M. J. Dorsey. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 72 (1938), pp. 371–375*).—Rating the Elberta as only about medium in hardiness of fruit bud and producing less full crops in southern Illinois than does South Haven, the author discusses several of the newer peaches with respect to hardiness of fruit buds, time of ripening, color of flesh, and general desirability. There was some indication that differential bud hardiness was more important in southern Illinois than further north.

Precooling rail shipments of Illinois peaches, with special reference to the use of ventilated packages, J. W. Lloyd (*Illinois Sta. Bul. 455 (1939), pp. 509–544, figs. 16*).—Studies involving four cars of Elbertas in 1935 and three cars of Elbertas and one of Red Birds in 1937 showed a more rapid reduction in the temperature of the fruit during the precooling treatment in ventilated than in standard packages. Temperature of the fruit at the time of initiating the precooling treatment had a marked influence on the rate of cooling, yet even under the cooler conditions prevailing the ventilated packages cooled more rapidly. Data presented in detail for each of the eight cars showed certain discrepancies which are explained on the basis of existing temperatures, adjustments in the precooling equipment, etc. The four cars under observation in 1937 were followed to their destinations in other States, with temperature readings made at certain points en route. In general, the differences in temperature between ventilated and standard packages in a single car became less as time progressed. There was some indication of less decay in the ventilated packages, although, on the whole, the fruit of both baskets arrived in good condition. The benefit of ventilation was shown chiefly in the firmer condition of the fruit due to its more rapid initial cooling. In conclusion, the author asserts that precooling appears worthy of adoption as a general practice for rail shipments of Illinois peaches. Ventilated packages equipped with ventilated liners are conceded worth while in both precooled and nonprecooled refrigerated cars.

Plum variety trials in central Washington, W. J. Clore, E. L. Overholser, and L. B. Wooton. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 384–388*).—Among points considered are date of blooming and ripening and the characters of recommended and promising varieties.

[The effect of different spray materials, such as bordeaux mixture, hydrated lime, and calcium acetate, in reducing the cracking of sweet cherry fruits] (*Idaho Sta. Bul. 229 (1939), p. 18*).—A brief report is presented.

Response of Howard 17 strawberry to sodium salts, L. P. Latimer (Univ. N. H.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 449–454; also New Hampshire Sta. Sci. Contrib. 70 [1939], pp. 449–454*).—Following the earlier report (E. S. R., 70, p. 481), in which it was indicated that in some years nitrate of soda caused a marked reduction in yield of Howard 17 (Premier) strawberries, the experiment was repeated with greatly increased numbers of replicates. Chemicals were applied in late July or early August in such a way that each of the cations Na, Ca, and NH_4 was combined separately with NO_3, PO_4, and SO_4 anions. In every case where Na was used, the yields the next

spring were significantly less than in the control plats or where ammonium salts were used. A slightly reduced yield occurred as a result of calcium nitrate fertilization. The plants were noticeably stunted where Na salts were used. In a repetition of the experiment, yields were reduced wherever Na salts were used, but calcium nitrate did not depress yields. Measurements of the leaves showed a reduced leaf area and a shortened petiole where Na was applied.

In another trial in which fertilizers were applied in early May, Na salts produced markedly reduced yields, varying from 33 percent with calcium nitrate to 50 percent with ammonium sulfate. The adverse effect on the leaves is believed associated with overvegetativeness since yields from the sodium acid phosphate plats did not differ significantly from the controls. Sodium sulfate caused a slight depression accompanied by decreased leaf area and shortened petioles. Apparently sodium salts were injurious to newly forming roots and are thus particularly harmful when applied in midsummer.

Some results of self-pollination of the highbush blueberry at Whitesbog, New Jersey, E. WHITE and J. H. CLARK. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 305–309*).—Under controlled conditions in the field is was found that although the percentage of total flowers to set fruits was much the same in self- as in cross-pollinations, the individual fruits were, in almost every case, smaller in the self-pollinations. The difference in size was sufficient, in many cases, to put the selfed berries in a less desirable commercial grade. Furthermore, the small berries resulting from selfing were often green at the time the larger, cross-pollinated berries were mature. In one or two crosses there was an indication of cross incompatibility.

Starch in the avocado tree, S. H. CAMERON and G. BORST. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 255–258, figs. 2*).—Using whole trees and branches from individual trees, the authors found that the smaller branches and, to a lesser degree, the smaller roots were more variable in starch content than were the larger units. Maximum starch in the tree as a whole occurred in midwinter and the minimum in late summer and early autumn. Starch storage was observed almost as promptly in the roots as in the branches, due, apparently, to the low-branching habit of the tree. On the other hand, starch declined somewhat more slowly in the roots. Starch content was much lower throughout the summer and autumn in a bearing than in a nonbearing tree. The results as a whole suggest that the periods of maximum and minimum starch content are not constant but fluctuate from season to season depending on environment, size of the crop, and time of harvest. At all times, readily detectable starch was found, particularly in the primary xylem. Roots contained relatively more starch at all times than did branches of similar diameter.

Coffee production practices in Puerto Rico [trans. title], J. GUISCAFRÉ ARRILLAGA and L. A. GÓMEZ (*Puerto Rico Col. Sta. Bul. 49 (1939), Span. ed., pp. 41, figs. 8; Eng. abs., pp. 40, 41*).—Based on a study of 398 plantations representing all possible conditions of location, altitude, type of soil, size, and type of management, the results show a notable lack of modern methods, especially in plant selection, use of fertilizers, pruning, and control of insects and diseases. As a result, the yields per unit area differ greatly, and since profitable production depends so greatly on good yields, there is a recognized need for improved cultural practices.

A further report on water use by Coachella Valley date palms, A. F. PILLSBURY. (Calif. Citrus Expt. Sta.). (*Date Growers' Inst. Rpt., 15 (1938), pp. 17–19, fig. 1*).—In continuation of this study (E. S. R., 80, p. 52), the author states that frequency of irrigation and amount of water required will vary with

the season and with the soil type and suggests that applications from 6 to 7 in. deep at minimum intervals in summer of 2 weeks are adequate for sandy soils. On finer soils, the interval may be somewhat longer with heavier applications. The use of a total of 9 ft. per year should be sufficient for all needs. Suggestions are given as to the timing and the amounts of applications.

Cold storage of date pollen, C. L. CRAWFORD. (U. S. D. A.). (*Date Growers' Inst. Rpt., 15 (1938), p. 20*).—Based on 2 years' studies, the author reports that dry date pollen stored in stoppered bottles and held at about 8° F. may be kept in a viable condition from one season to the next.

The size of date fruit as affected by soil moisture, D. C. MOORE. (U. S. D. A.). (*Date Growers' Inst. Rpt., 15 (1938), pp. 3, 4*).—A 3-yr. study of the response of the Hayany date to soil moisture showed that applications of irrigation water in amounts of 8, 15, or 20 acre-ft. per year did not prevent some of the soil to a depth of 6 ft. from having its moisture reduced to the permanent wilting percentage. Where sufficient water was applied to reduce the proportion of soil to reach this percentage, the increased water usually increased the number of leaves and the size of the fruits.

Maturation and storage studies with soft varieties of dates, R. H. HILGEMAN and J. G. SMITH. (Ariz. Expt. Sta.). (*Date Growers' Inst. Rpt., 15 (1938), pp. 14–17, fig. 1*).—Comparing a short high-temperature treatment followed by cold storage with the present commercial methods of extended low-temperature processing, the authors report that, in general, high-heat treatments produced dates inferior to those processed at low temperatures. No significant differences were evident between high-heat treatments at 140° and 150° F. for periods of from 2 to 4 hr. High heat may be applied successfully to Halawi dates except when very dry and was moderately successful with Khadrawi dates if they were dry, but in only 1 of 5 yr. proved successful with either Hayany or Maktoom. Moisture-proof containers retarded the formation of sugar crust and sugar spot but accelerated darkening and loss in flavor. Picking of early ripening dates should be delayed until the translucent stage is reached.

Growth of lemon fruits in relation to moisture content of the soil, J. R. FURR and C. A. TAYLOR (*U. S. Dept. Agr., Tech. Bul. 640 (1939), pp. 72, figs. 24*).—Concerned primarily with the response of lemon trees to decreasing soil moisture under orchard conditions, experiments were set up on several soil types to establish the effects on the growth of lemon fruits of wetting various proportions of the soil in the root zone. The results indicated that under the usual summer conditions the trees may obtain adequate moisture from as little as 50 percent of their root systems, provided the average moisture content of the wetted soil is relatively high. Apparently, an increased rate of extraction compensates in part for the reduction in absorbing area. It was evident, however, that the total amount of water absorbed by a tree decreased progressively with decrease in available wetted area.

Depth of soil favorable to root development was a potent factor in tree size and fruit growth. In one orchard on variable soil, trees in soil 2 ft. deep wilted at the same time as much larger nearby trees in soil from 4 to 5 ft. deep. In variable soils, average moisture content in the principal root zone may not serve as a reliable guide for timing irrigation. Readings should be based on samples from the zone of greatest root concentration.

Studies indicated that the relative moisture deficit of the lemon trees may be determined fairly accurately from the apparent growth rate of the fruit from a 20-cc. volume to the yellowing stage. A few trees should be supplied ample water to serve as standards of comparison. If water is withheld until

the apparent growth ceases, the ultimate size of the fruit will be reduced and considerable leaves will be lost. Apparent growth rate is deemed most useful as a guide for adjusting the irrigation interval already in use, and should be used in connection with soil moisture readings.

Root composition and top development in large pecan trees headed to various degrees of severity in top working, C. L. SMITH, J. HAMILTON, C. J. B. THOR, and L. D. ROMBERG. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 11, pp. 821–842, figs. 10*).—Analyses of the roots of trees of an average diameter of about 12 in. and headed back in varying degrees of severity prior to top working showed certain well-defined differences in composition as compared with nonheaded control trees. Starch and N were the most variable of the constituents studied. Starch was relatively very low in the roots of all headed trees and showed little fluctuation following cutting as compared with the behavior of the controls. The total leaf area, practically inversely proportional to the degree of severity of the heading, was apparently inadequate to synthesize sufficient carbohydrate to support growth, heal the wounds, and leave any excess for storage. The concentration of N in the roots was about the same in the control as in the headed trees. Sugars in pecan roots were apparently not of storage nature but labile forms for conversion into more complex carbohydrates. As to wounds, their rate of healing was approximately proportional to the amount of leaf area per tree. Cuts above 4 in. in diameter were slow to heal, and their use also resulted in so great a loss of leaf area as to prevent the adequate food development for normal recovery.

A physiological study of the prefilling period of fruit development in the pecan, C. J. B. THOR and C. L. SMITH. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 12, pp. 905–910, figs. 4*).—Analyses of pecan nuts at frequent intervals after pollination showed that the development of the shell was completed during the prefilling period. The shell developed rapidly during August, showing complete hardening during the first 3 weeks of that month. This development was accompanied by a rapid increase in acid-hydrolyzable polysaccharides and dry matter and a decrease in total sugars. The shuck development also was completed during the prefilling period, except for an increase in ash content and slight changes in the total sugars and acid-hydrolyzable polysaccharides. The prefilling period extends from date of blossoming to the begining of oil formation in the kernel.

Common native shrubs of Mississippi for landscape plantings, F. S. BATSON (*Mississippi Sta. Cir. 100* (*1939*), *pp. 13*).—Brief comments and descriptive notes are offered.

FORESTRY

[Forestry studies by the Indiana Station], R. C. BRUNDAGE, D. DENUYL, and J. C. KASE (*Indiana Sta. Rpt. 1938, pp. 62–68, figs. 4*).—Progress reports are presented on the following studies: Marketing basket veneer and various woodland products, the effect of woodland management on yield and returns from marketable products, the establishment of Asiatic chestnuts, the destruction of undesirable weed trees, the propagation of tree seedlings, the establishment of windbreaks, and the propagation of plants useful in wildlife propagation.

Ohio Forest News, [July 1939] (*Ohio Forest News* [*Ohio Sta.*], *No. 36* (*1939*), *pp. 8, pl. 1, figs. 7*).—This is devoted to the historical aspects, geology, tree flora, and development of the Scioto Trail State Forest.

Development of timber industry in Tennessee and United States, C. E. ALLRED, S. W. ATKINS, and F. M. FITZGERALD (*Tennessee Sta., Agr. Econ. and*

Rural Sociol. Dept. Monog. 92 (1939), pp. II+88, figs. 8).—In mimeographed form there are presented facts concerning the early history and present status of forestry in Tennessee. Among subjects considered are the geographic shifts of lumber and forest products in the United States, trends in lumber production in Tennessee, and relation of lumber production to consumption.

DISEASES OF PLANTS

Report of the 1939 annual meeting of the southern division of the American Phytopathological Society (*Phytopathology, 29 (1939), No. 8, pp. 749–757*).—Abstracts of the following papers are included: Leaf Blotch, a New [*Ciboria*-associated] Disease of Rice and Certain Native Plants in Louisiana, by T. C. Ryker; Further Studies on Control of Soil Rot of Sweet Potatoes, by L. H. Person; The Necessity of Rotation of Crops for the Control of Diseases of the Sweet Potato, by R. F. Poole; Seed and Soil Treatments for Combating Damping-Off of Tomatoes, Eggplants, and Peppers, by L. H. Person; The Possible Control of Root-Rot Fungi by Soil Treatment With Chemicals, by R. F. Poole; Difference in Susceptibility of Tomato Varieties to *Septoria* and *Macrosporium* Leaf Spots, by J. O. Andes; Control of *Cercospora* Leaf Spots of Peanut With Various Dusts and Sprays, by L. Shaw; Bordeaux Injury to Cucumbers, by A. G. Plakidas; Carbon Dioxide Evolution From Certain Soils in Relation to Black Root Rot of Flue-Cured Tobacco, by J. A. Pinckard and L. Bozovaisky; An Internal Collar Rot on Cotton, by C. J. King and H. D. Barker; Root-Knot Nematodes on Cotton and Tomatoes in Tennessee, by C. D. Sherbakoff; Observations on the Root-Knot Nematode in the San Joaquin Valley of California, by C. E. Scott, M. A. Lindsay, and G. J. Harrison; Preliminary Report on Cotton Wilt-Nematode Experiments at Lumberton, North Carolina, by A. L. Taylor, H. D. Barker, and O. P. Owens; Benefits of Winter Green-Manure Crops in Controlling *Phymatotrichum* Root Rot of Cotton, by C. J. King and J. T. Presley; Relation of Variations in Rainfall in 1938 to Prevalence of Cotton Root Rot, and Girdling of Cotton Plants as Affecting Survival of *Phymatotrichum omnivorum*, both by W. N. Ezekiel; Attempts to Control *Verticillium* Wilt of Cotton and Breeding for Resistance, by B. A. Rudolph and G. J. Harrison; Permeability of the Testa of Normal and Treated Cotton Seeds, by J. G. Brown; Fungi Associated With Seedling Diseases and Boll Rots of Cotton in Eastern United States in 1938, by P. R. Miller; Factors Influencing the Distribution and Persistence of Angular Leaf Spot in Irrigated Cotton Fields, by C. J. King and R. B. Parker; Effect of Period and Type of Storage of Cotton Seed After Treatment With Organic Mercury Dusts, by L. E. Miles; Seed-Treatment Tests With Cotton in 1938, by D. C. Neal; Seedling Survival as Affected by Certain Mercury, Copper, and Zinc Preparations not Included in the Regional Cotton Seed Treatment Tests for 1938, by S. G. Lehman; Treatment of Cotton Seed With Organic Mercury Dust and Sulphuric Acid, by G. J. Harrison; Variability of *Fusarium vasinfectum* in Culture, by R. Weindling; Some Tests of Varietal Susceptibility to a Combination of Nematodes and Cotton Wilt, by L. E. Miles; Artificial Inoculation With the Cotton-Wilt Fungus, *Fusarium vasinfectum*, by D. C. Neal; Progress in Soil-Contamination Studies With *Fusarium vasinfectum*, by A. L. Smith; Relation of Unbalanced Fertilization to the *Fusarium* Wilt of Cotton, by V. H. Young and W. H. Tharp; The Effects of Nitrogen Source, Nitrogen Level, and Relative Acidity on *Fusarium* Wilt of Cotton, and Effects of Nitrogen, Phosphorus, and Potassium Nutrition on the *Fusarium* Wilt of Cotton, both by W. H. Tharp and C. H. Wadleigh; and A Study of Virulence in Relation to Cultures of *Fusarium vasinfectum*, by E. M. Cralley.

The Plant Disease Reporter, [July 1 and 15, 1939] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 23 (1939), Nos. 12, pp. 203–208; 13, pp. 209–223, figs. 3*).—The following are included:

No. 12.—Occurrence of spotted wilt in Missouri, by J. T. Middleton; muck crop diseases to date in New York State, including onion smut, downy mildew, and pink root, Pythium "stunt" of lettuce, and wind injury to lettuce and onions, by A. G. Newhall; losses from potato diseases in the Hastings section, Florida, in 1939, by A. H. Eddins; cotton diseases in central Texas, by C. H. Rogers; reports on X-disease (yellow-red virosis) of cherry and peach (on wild cherry in Massachusetts and on peach and choke cherry in New York); some records of first appearance or unusual occurrence (downy mildew on oats in Mississippi, flax wilt in Oregon, and blackfire of Perique tobacco in Louisiana): and brief notes on plant diseases, including stem nematode in strawberry fields in the Pacific Northwest, bacterial wilt on sweet corn in New York, and diseases of small grains in central Texas.

No. 13.—A survey of cotton seedling diseases in 1939 and the fungi associated with them, by P. R. Miller and R. Weindling; tobacco seed-bed disease survey in Wisconsin, 1939, by J. Johnson; some obscure peach diseases in Idaho, by E. C. Blodgett; first report of the popcorn disease (*Sclerotinia carunculoides*) of mulberry in Arkansas, by J. C. Dunegan and E. J. Allen; vegetable disease notes in New York, by C. Chupp; incidence of potato leaf roll on Long Island, by W. G. Been; cereal diseases in Oregon and adjacent Washington in 1939, by R. Sprague; and bacterial ring rot of potato in Oregon, by C. E. Owens.

Fifty years of plant pathology research, W. B. Tisdale. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 11, pp. 8, 9, fig. 1*).—This article briefly tells the history of problems in phytopathology which the Florida Station has had to combat during its first half century and of numerous solutions to these problems.

Plant pathology (*Hawaii Sta. Rpt. 1938, pp. 34–42*).—Progress reports are given on work by G. K. Parris with a new disease of papaya of possible virus nature, bean rust (*Uromyces phaseoli typica*), "ring spot" on tomatoes, early blight of potatoes, soft rot (*Pythium* sp.) and vascular necrosis of taro, and varietal resistance to these two troubles; by Parris and K. Kikuta on root knot of tomatoes and potato seed piece rot control; and by Parris and J. C. Ripperton on ergot of *Paspalum* spp. due to *Claviceps paspali*, including Hawaiian localities where found; and a list of miscellaneous plant diseases in Hawaii (1937–38).

Plant diseases (*Idaho Sta. Bul. 229 (1939), pp. 30–32*).—Brief reports are included on the development of new beans possessing resistance to curly top and mosaic; demonstration of seed transmission of near-wilt of peas; fruit disease investigations, including cherry mottle leaf, gooseberry mildew control by sulfur fungicides, drought spot or gum spot of prunes associated with boron deficiency, and cyclamen mite infestation of strawberry plantings; and Katahdin potato seedlings showing resistance to virus diseases.

[Plant disease studies by the Indiana Station]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1938, pp. 11, 37–42, 51, 52, 79, figs. 5*).—Brief reports are included on the effect of black stem rust on the composition of wheat, by H. R. Kraybill and D. M. Doty; peppermint anthracnose control, and extremely early maturing of apple scab ascospores in 1938, both by R. C. Baines; seed transmission of tomato early blight, by R. W. Samson; tomato seed treatment, by Sampson and L. C. Shenberger; the taxonomy of plant rust fungi, by G. B. Cummins; wheat breeding for combined resistance to disease and Hessian fly, and effects on yield of seed treatment of smut-free oats, both by R. M. Caldwell

and L. E. Compton; root nematodes of tomatoes, by G. A. Ficht; and *Fusarium* wilt of China aster, by E. R. Honeywell.

Plant disease control, A. G. Plakidas (*Louisiana Sta., Fruit and Truck Sta. Bien. Rpt. 1937–38, pp. 22–29*).—Reports of progress are given on strawberry diseases (late summer spraying for control of leaf blights, spray adjuvants, studies of the nature of resistance to leaf spot, the mode of action of bordeaux on *Mycosphaerella fragariae*, and two new leaf-spotting fungi—apparently undescribed species of *Cercospora* and *Mycosphaerella*); rosette on dewberries and blackberries due to *Cercosporella rubi;* dying of pear and tung trees associated with *Dothiorella* sp.; *Phytophthora cinnamomi* root rot of tung trees; intervenal browning, translucent spot, and white tree abnormalities of tung trees; and control of downy mildew (*Pseudoperonospora cubensis*) of cucumbers.

Plant diseases (*Nebraska Sta. Rpt. 1938, pp. 32, 33*).—Brief reports are included on studies of scab, *Fusarium* wilt, and *Rhizoctonia* of potato, including breeding for resistance; bacterial blight of bean; and a seasonal plant disease survey for the State.

Fungus diseases and transpiration [trans. title], A. Hilitzer (*Studia Bot. Čechoslovaca, 1 (1938), No. 1, pp. 20–36*).—The author briefly reviews the literature (9 references) and presents the results of experiments on a large number of fungus-infected plant species of diverse groups. Except for three cases the diseased plants all exhibited an increased transpiration.

A small cage for insect vectors used in plant inoculations, N. J. Giddings (U. S. D. A.). (*Phytopathology, 29 (1939), No. 7, pp. 649, 650, fig, 1*).—A cloth-covered glass cage 22 mm. in diameter and 22 mm. high is held in place on a ground glass base by two stainless steel coil springs attached to brass cross-pieces under the base and over the top.

A method for testing the toxicity of volatile compounds, D. E. Pryor and J. C. Walker. (Univ. Wis. et al.). (*Phytopathology, 29 (1939), No. 7, pp. 641–643, fig. 1*).—The authors describe a transfer chamber and a glass plate on which a sterile agar film of uniform thickness may be poured. After hardening, identical disks are cut from this film with a sterile "biscuit cutter" and transferred to the inside of covers of containers such as Petri dishes or glass-top jars. The inoculum is deposited on the exposed agar surface, the material to be tested is placed in the desired amount and concentration in the bottom of the container, and the top is sealed. The toxicity of the volatile substance is then determined by its effect on the fungus growth.

Theoretical principles underlying laboratory toxicity tests of fungicides, F. Wilcoxon and S. E. A. McCallan (*Contrib. Boyce Thompson Inst., 10 (1939), No. 3, pp. 329–338, figs. 3*).—Toxicity curves are of two types, viz, those obtained by quantitative measurements of such properties as germ tube length or colony diameter and those in which the test divides individuals into two categories, as germinated and nongerminated spores. In the latter type the curves result from the fact that each spore has its own particular lethal dose, and there is a distribution of individual lethal doses which is usually normal when plotted against the logarithm of concentration. The problem in toxicity tests is to deduce the properties of the curve of individual lethal doses from the toxicity data obtained. These methods lead to an estimation of the LD50 value (concentration preventing 50 percent germination), and the range within which it may be expected to lie 19 out of 20 times. The methods may be extended to give an estimate of the LD95 and its corresponding zone of error. In comparing fungicides that have been run at different times or in different laboratories, they should be rated in terms of a standard run simultaneously with the unknown to reduce errors from many obscure causes.

The **fungicidal activity of phenothiazine and some of its oxidation derivatives**, M. C. GOLDSWORTHY and E. L. GREEN (*Phytopathology, 29 (1939), No. 8, pp. 700–716, fig. 1*).—Analysis of the results of various perfusion, residue, and orchard-spraying experiments indicates that phenothiazine (hitherto known as an insecticide) and its known oxidation derivatives are a fungicidally interesting group, and the data show that for this purpose phenothiazone is the most important member. Field spray tests over a period of several years have demonstrated that phenothiazine, with or without adjuvants, is of value against apple scab, and laboratory studies have indicated that it is also toxic to the fungi of peach brown rot and apple bitter rot. Laboratory tests of its oxidation derivatives—phenothiazine sulfoxide, phenothiazone, and thionol—indicate that the active principle of phenothiazine is phenothiazone, and that the latter is toxic to *Sclerotinia fructicola* and *Glomerella cingulata* in dilutions as low as 2.5 p. p. m. by volume in water. Limited phytocidal tests on two peach varieties with phenothiazine sulfoxide, phenothiazone and thionol resulted in no injury to leaves or bark (no data on fruit).

Alkaloids from Sanguinaria canadensis and their influence on growth of Phymatotrichum omnivorum, G. A. GREATHOUSE. (U. S. D. A. and Tex. Expt. Sta.). (*Plant Physiol., 14 (1939), No. 2, pp. 377–380*).—Sanguinarine, chelerythrine, and protopine were isolated from the roots and rhizomes of *S. canadensis*, and the first was shown experimentally to prevent the growth of *P. omnivorum* at 2.5 p. p. m. while the other two alkaloids proved less toxic. The evidence presented is believed to indicate that alkaloids play an important role in the resistance of *S. canadensis* to *Phymatotrichum* root rot.

The **number of spores in a pycnidium of Septoria apii**, K. H. LIN. (Cornell Univ.). (*Phytopathology, 29 (1939), No. 7, pp. 646, 647*).—Using a "counting field," the spores of 9 pycnidia were separately counted, averaging 3,675 each. The average number of pycnidia per leaf spot was found to be 56. It was estimated that if only 10 primary lesions occurred in a seedbed there would be possibly 1,500,000 spores available as secondary inoculum before the plants were set in the field.

Identity and parasitism of a species of Dothichloë, W. W. DIEHL. (U. S. D. A. et al.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 12, pp. 947–954, pl. 1*).—*D. limitata* n. sp. is described, with an account of its known distribution from North Dakota to Brazil and its host range in eight grass genera. Field observations and experiments indicate that low temperatures inhibit the fungus fructifications, and that infection is systemic with resultant sterility but without obvious lesions or strikingly abnormal coloration of affected grasses.

Studies of boron deficiency in Idaho soils, W. E. COLWELL and G. O. BAKER. (Idaho Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 6, pp. 503–512, figs. 5*).—"A greenhouse method suitable to detect boron-deficient soils is described. A good correlation was obtained between greenhouse and field experiments. Preliminary field tests in northern Idaho indicate that fall applications of borax at the rate of 40 to 60 lb. per acre are superior to spring applications in overcoming yellowing in alfalfa. The results of a limited number of analyses on alfalfa indicate that a high boron content of alfalfa is associated with freedom from yellowing. The investigations are of preliminary character. Further work is being done to substantiate these findings."

Studies on the susceptibility of forage grasses to cereal smut fungi.—III, Further data concerning Tilletia levis and T. tritici, G. W. FISCHER. (U. S. D. A., Wash. Expt. Sta., et al.). (*Phytopathology, 29 (1939), No. 7, pp. 575–591, figs. 2*).—Continuing this series (E. S. R., 81, p. 382), inoculation tests on various grass species of the tribe Hordeae have added *Agropyron*

inerme, *A. spicatum*, *A. trichophorum*, and *Sitanion jubatum* as new hosts of *T. levis* and *T. tritici*. Tested on *A. cristatum* and *A. pauciflorum*, physiologic races of these 2 bunt fungi differed greatly in virulence. In comparative tests of their virulence, as species, on these 2 grasses, *T. levis* was ±35 percent more virulent on *A. cristatum* but slightly less so on *A. pauciflorum*. Much greater differences were noted in the reactions of the 36 selections of the 2 grasses to the smut races than in the relative virulence of the latter. Although none of the 20 selections of *A. cristatum* were immune to *T. levis*, a few were highly resistant. On the other hand 8 of the 16 selections of *A. pauciflorum* were apparently immune to all 8 races of *T. levis*. Other selections of the 2 hosts were moderately susceptible to more or less resistant. The same selections proving resistant to *T. levis* were, in general, also resistant to *T. tritici*. Of the 2 grasses, *A. cristatum* as a species was the more susceptible to wheat bunt. The evidence indicates the mycelium of the 2 fungi to be perennial in perennial hosts, though not indefinitely. Of 90 plants of *A. cristatum*, *A. pauciflorum*, *A. subsecundum*, and *Hordeum nodosum* showing smut in 1935, 39 had in some manner been freed of infection during the 2 succeeding years, 7 had died, and 44 still retained the infection in 1937. In general, it is deemed probable that the duration of perennation of the mycelium of these smuts in their perennial hosts will be influenced by the degree of susceptibility of the host, and by its predisposition to drought or winter injury. It is noted that smut balls of *T. tritici* were found in a sample of sweetclover seed, but obviously from some grass, this being recorded as the second instance of its natural occurrence on a forage grass. It was observed that bunted plants resulting from infection with *T. tritici* tended to be more or less stunted.

Inoculation experiments with loose smuts of wheat and barley (Ustilago tritici and U. nuda), A. J. P. Oort (*Phytopathology, 29 (1939), No. 8, pp. 717-728, figs. 4*).—Inoculations of wheat and barley with *U. tritici* and *U. nuda*, respectively, were made by modifications of Moore's method (E. S. R., 75, p. 639) which are fully described. Under the experimental conditions the loss of plants at emergence and during winter was slight—a total of only 10 percent for wheat regardless of inoculation period or concentration of spore suspension. In barley there was some relation between loss of plants and the last two factors, yet the total maximum loss did not reach 20 percent. There appeared to be no relation between the occurrence of partly diseased plants and the period of inoculation or the concentration of the spore suspension. The optimum period for infection lasted only a few days and during anthesis. The spore inoculum had a maximum effect for wheat and for barley at concentrations of 1 and 0.1 gm. spores per liter of water, respectively. At concentrations of ±0.001 gm. spores per liter, or ±10 spores per cubic millimeter, a fairly good infection occurred. With increase of pump strokes from 2 to 10 the number of smutted plants increased (tested with wheat only). Whether the maximum is already reached at 10 pump strokes is uncertain, but for practical reasons a larger number is not recommended.

The effects of stinking smut (bunt) and seed treatment upon the yield of winter wheat, T. A. Kiesselbach and W. E. Lyness (*Nebraska Sta. Res. Bul. 110 (1939), pp. 22*).—Annual tests (9 yr.) of the relationship between infection with the races of *Tilletia levis* prevailing in Nebraska and the grain yield of a standard susceptible winter wheat variety (Kanred) indicated a rather regular decrease in weight per bushel with increasing infection (ascribed to the greater proportion of bunt balls in the threshed grain) and a rather close inverse relation between the annual and the average bunt counts and the yields. Of the various fungicides tested (3-8 yr.) copper carbonate and

New Improved Ceresan dusts proved most practical and were highly effective in bunt control without seed injury. Formaldehyde in proper dosage (immersion or sprinkling) gave effective control but induced sufficient seed injury to lower the yield significantly. Of 115 lots of medium to highly bunted seed receiving the recommended treatments, only 10 gave bunt-free crops, the others ranging up to 9.6 percent bunted heads. Treatment during 2 successive years is thus apparently needed for a complete clean-up, with further treatments at frequent intervals suggested to retain a bunt-free condition. Removal of bunt balls by a fanning mill in connection with seed treatment (4 yr.) lowered the bunt infection more than with the treatment alone. It was found that with heavily infected, unfanned wheat the seed may become reinfected after treatment by rough handling, causing the rupturing of bunt balls with viable contents.

In a nursery, heavy infection of nearly bunt-free seed was induced by using bunt balls taken from other wheat after fungicidal treatment. Deep planting of heavily bunted seed increased the infection in the resultant crop by 40 percent and lowered the yield 38 percent as compared with shallow planting—attributed to differing temperature conditions. The great increase in bunt infection following a 3 weeks' later sowing is attributed to the lower soil temperature at that time which is more favorable for bunt development. All progenies from spontaneously inoculated seed wheat up to 7-year-old seed developed bunt, and when healthy seed was inoculated with bunt varying in age up to 7 yr. the resultant crop also developed bunt. As an average of three tests in 1928, an increase of 36.2 percent bunted heads lowered the straw yield only 0.3 percent, whereas the grain yield was reduced 29 percent. As an average for 4 yr., the new bunt-resistant Nebred variety, selected and distributed by the station, produced only 0.6 percent bunted heads from inoculated seed as compared with 14.8 percent for similarly bunted seed of a standard variety.

Stem rust destructive to spring wheat in 1878, L. M. HAMILTON (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1939, pp. 11*).—"Although pioneer farmers of the Middle West knew that the presence of stem rust on their grain meant reduction in yield, accurate rust observations were not made until comparatively recently. There were severe epidemics in 1916 and in 1904, but previous to this reports of rust are scattered and little is known regarding epidemics. The present report represents an attempt to summarize material regarding 1878, one of the early rust years. Because of nonavailability of material, it has been necessary to restrict discussion largely to Minnesota."

Brown necrosis, a discoloration associated with rust infection in certain rust-resistant wheats, E. S. MCFADDEN. (U. S. D. A. and Tex. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 11, pp. 805–819, figs. 4*).—The author presents experimental data, together with evidence from the literature (13 references), apparently demonstrating that much of the so-called black chaff disease (previously confused with other diseases, particularly bacterial black chaff) reported in Hope and H–44 wheats and their rust-resistant derivatives is merely a manifestation of resistance to stem rust. Infection before the host tissues had been long exposed to sunlight resulted in the development of pigmented areas ("brown necrosis") in certain wheats such as these two varieties, which possess a specific type of mature-plant resistance to stem rust, while rust-susceptible varieties and those with other types of resistance remained free from this melanistic reaction. Two distinct types of mature-plant resistance to stem rust ("photologic" and "morphologic") were found to segregate from the cross H–44 × Marquis. Brown necrosis developed only in plants with the photologic type, which possibly may explain previous reports of close

but incomplete "linkages" and "associations" of stem rust resistance with susceptibility to the so-called black chaff. Inoculations of F_2 plants from H-44 × Marquis wheat demonstrated that the brown necrosis reaction can be used as an indicator for identifying plants carrying the factor for photologic resistance prior to the blooming period, thus simplifying breeding for rust resistance by the backcross method.

The effect of salicylic aldehyde on the infection of wheat by Pythium arrhenomanes Drechsler, and the destruction of the aldehyde by Actinomyces erythropolis and Penicillium sp., V. E. Graham and L. Greenberg (*Jour. Bact., 38 (1939), No. 1, p. 116*).—An abstract of an article previously noted (E. S. R., 81, p. 226).

Factors affecting the development of Puccinia coronata in Louisiana, I. L. Forbes. (La. State Univ.). (*Phytopathology, 29 (1939), No. 8, pp. 659-684*).—*P. coronata* urediospores rapidly lost their germinability when kept at −18° or 33° C., but when stored at 10° up to 8 percent germinated after 413 days. At 4°, 15°, and 20° urediospores rather quickly lost their viability. Exposed to summer field conditions at Baton Rouge, La., they did not germinate after 75 days. Since there were no oats or susceptible wild grasses at Baton Rouge from July 1 to October 1, 1933, and since fall-planted oats do not rust before late December, it is concluded that crown rust inoculum is blown in from other regions. The minimum, optimum, and maximum temperatures for urediospore germination were 0°-2°, 15°-20°, and slightly below 35°, respectively. Rust developed on plants incubated at 0°-2° and postincubated at 20°, but failed to do so on plants incubated at 10° or 20° and postincubated at 0°-2°. The blue and to a lesser extent the violet rays are held responsible for the negatively phototropic response of urediospore germ tubes to white light in the rusts thus tested, viz, *P. coronata*, *P. graminis avenae*, *P. graminis tritici*, and *P. triticina*. The germ tubes of *P. coronata* seemed to enter the host without difficulty, either in light or darkness. The minimum pH for crown rust urediospore germination was ±2.7, the optimum 6.7, and the maximum 9.2. Oat variety reactions to crown rust were studied under field conditions in Minnesota and Louisiana, the most highly resistant variety during the 3-yr. tests being Victoria. Bond was immune in the field at Baton Rouge in 1933 and 1934. Extracts from the highly resistant Victoria and from the immune Bond (immune to attack by the rust forms used) markedly reduced the percentage of urediospore germination over that in controls and in extracts from the susceptible variety Victory, and also induced much distortion of germ tubes and delayed their growth rate. There are 43 references.

Early Blackhull resists stem rust in Texas, E. S. McFadden. (U. S. D. A. and Tex. Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 644, 645*).—This winter wheat proved moderately resistant in the field to *Puccinia graminis tritici* at several experimental stations in Texas where 10 physiologic races were known to be present, the variety remaining relatively free from the disease for about 2 weeks after certain other varieties had become heavily infected. Shortly before ripening, and too late for much injury, Early Blackhull may develop considerable rust as small, distinctly isolated pustules. An occasional F_3 segregate from crosses between this variety and wheats possessing the Hope type of mature-plant resistance proved resistant both early and late in its growth cycle.

Prevalence of Basisporium gallarum in arrested axillary shoots and secondary ears of maize, J. H. Standen. (Iowa Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 656, 657*).—Arrested axillary shoots of corn were found infected up to 42.3 percent in field samples in 1937, and up to 80.59 percent

in 1938. Secondary ears were much more frequently infected than primary ears, infection in the former being favored by poor development.

Pythium root rot of milo and the development of resistant varieties, J. B. Kendrick and F. N. Briggs (*California Sta. Bul. 629 (1939), pp. 18, figs. 7*).—This destructive disease (*P. arrhenomanes*) has been recognized in the upper delta region of the Sacramento River since 1935. Now widespread, it is said to be the limiting factor in production of the common varieties in this area. Spread occurs by overflow water, irrigation, or transfer of infested soil by any other means. The roots are destroyed in the seedling stage or, in less severe attacks, the plants become stunted and weakened. A greenhouse variety test indicated Double Dwarf Darlo, a new variety developed by the station, to be highly resistant, on most soils comparing favorably with Double Dwarf Yellow in yield but with the disadvantage of being about 2 weeks later in some sections and less tolerant of alkali and heat than the latter. Badly diseased commercial fields of Double Dwarf Yellow and Dwarf White milos showed a few apparently normal plants, and single-plant selections of these two varieties were made in severely diseased commercial plantings in 1936. Greenhouse trials in spontaneously infested field soil (1936–37) showed most of these strains to be highly resistant, and the results were later confirmed in extensive field tests. A considerable number of heads were bagged in the field to secure pure-line resistant seed, and further greenhouse and field trials indicated the selected strains to be practically 100 percent resistant. Considerable resistant seed from the Double Dwarf Yellow milo selections is now available and is being distributed through the Calapproved plan as Double Dwarf Milo 38. Resistant strains of Dwarf White and Heileman are to be increased for distribution under the same plan.

Penetration of potato-tuber tissue by Rhizoctonia solani in relation to the effectiveness of seed treatment, L. A. Schaal. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 8, pp. 759, 760, fig. 1*).—Seed potatoes treated with mercury compounds gave incomplete control of *R. solani* as tested in Maine, and culture of the tuber tissue under sclerotia killed by the treatment showed viable mycelium therein. Cross sections indicated the mycelium to have invaded the periderm and tissues below it, probably thus offering sufficient protection to prevent killing of all of the fungus by tuber disinfectants.

Occurrence of hopperburn resistance and susceptibility in the potato, T. C. Allen and G. H. Rieman. (Wis. Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 6, pp. 139–142*).—Study of the behavior of new and old varieties of potato toward hopperburn (due to *Empoasca fabae*) indicated that the early maturing varieties are, in general, more susceptible. It is thought that the tolerance shown by the two recently introduced varieties Houma and Katahdin may readily account, in part, for the heat and drought resistance attributed by various investigators to these two varieties. By selecting normal and hopperburn-injured individual plants in segregating seedling populations grown under epidemic conditions in the field, it was possible to separate segregates into two distinct levels of hopperburn tolerance. A number of seedling cultures were isolated which showed a greater degree of resistance and of susceptibility to hopperburn than any of the new or old varieties tested. The relative percentages of hopperburn resistance and susceptibility were based on the ratio of necrotic hopperburn tissue to healthy green tissue in the various potato leaf tissues considered.

[Rice disease studies.] (Partly coop. U. S. D. A.). (*Louisiana Sta., Rice Sta. Bien. Rpt. 1937–38, pp. 19, 20, 23–28, figs. 3*).—Brief reports are given on studies of rice diseases, including pecky rice (high percentages correlated with

Helminthosporium infection), by T. C. Ryker and W. A. Douglas; and disease surveys—1937–38, root rot, *Cercospora* leaf spot, banded sclerotial disease, leaf blotch—a new disease associated with a sterile fungus, and white tip control, all by Ryker.

Relative efficiency of quasi-factorial and randomized-block designs of experiments concerned with damping-off of sugar beets, E. L. LeClerg. (U. S. D. A. and Minn. Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 637–641, fig. 1*).—"The quasi-factorial design of plat arrangements was more efficient than a randomized-block test in some seasons for damping-off tests with sugar beets, with 36 treatments, in the field. With 25 or fewer treatments, the quasi-factorial design was less efficient in most comparisons, although it was more efficient in a few. In greenhouse experiments, made on two types of plant beds, marked losses in efficiency resulted with quasi-factorial design as compared with a randomized-block arrangement."

Recovery from and acquired tolerance of curly top in Nicotiana tabacum, J. M. Wallace (*Phytopathology, 29 (1939), No. 8, pp. 743–749, figs. 4*).—Diseased plants commonly recovered from severe symptoms by the gradual production of less severely affected leaves from the severely diseased terminal, or by producing axillary shoots free of symptoms or nearly so. Plants grown from cuttings from recovered cases showed a slight variation in symptoms from time to time, but in no instance did they relapse permanently into a stage equaling the typical symptoms produced by inoculation of healthy plants via beet leafhoppers. Virus was found in recovered plants and in plants of the fourth vegetative generation. Cuttings grown from recovered plants showed no effects when reinoculated with the virus. Recovery from one strain of virus conferred protection against another strain as well as against mixed, unidentified strains. Recovery of tobacco from curly top and the acquired tolerance associated with it is said to resemble in many respects that reported for ring spot of tobacco and curly top of tomato. It is suggested that acquired tolerance following recovery of plants from virus diseases may offer the best material yet available for studying the nature of immunological-like phenomena in plants.

Viscosimetric studies on the tobacco mosaic virus protein, I, V. L. Frampton. (Cornell Univ.). (*Jour. Biol. Chem., 129 (1939), No. 1, pp. 233–244, figs. 8*).—"An adaptation of the Ostwald viscometer is described. Sols of the virus protein show a marked anomalous viscosity which increases on decreasing the pH of the solution. The anomaly shown by sols of the virus protein is greatly reduced in the presence of urea and glycine. The virus activity of the virus is not immediately affected on the addition of urea or glycine. The application of the Kuhn equation to this protein has been shown not to be valid."

Studies on the nature of brown root rot of tobacco and other plants. J. Johnson. (U. S. D. A. and Univ. Wis.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 11, pp. 843–863, pls. 2, figs. 5*).—The true nature of this disease is held to be unknown, though it occurs on a wide variety of plants and on tobacco most frequently following certain grass or legume crops. The legume family is particularly susceptible, but susceptibility is apparently not correlated with the origin or persistence of the inciting agent in the soil. The experiments here reported were conducted in the greenhouse, largely on soils from Massachusetts. The causal agent was found to be relatively slow in its action on the roots and, as judged by dilution experiments, not highly concentrated in the soil. Whatever the agent, it is destroyed in 24 hr. at 45° C., by freezing, by desiccation, and by certain chemicals, some of which are relatively low in germicidal value at the concentrations used. Powdered charcoal and soil (2–100) also eliminated the disease. Reduction of the causal agent in the soil apparently depends

largely on exposure of soils (cultivated soils in particular) to extremes of heat, cold, and drought. Histological and cytological study of diseased tissues failed to reveal any associated organism. Diseased cells were usually sharply delimited from normal cells, and affected cell walls were yellow and thickened, with cell contents discolored and granular. The lesions may be superficial or may extend to and follow the stele. No new theory as to cause of brown root rot is offered, but it is thought that the data presented should aid materially in further studies on its etiology. There are 18 literature references.

Recognizing and treating the common greenhouse vegetable diseases and a description of two diseases new to Ohio, L. J. ALEXANDER. (Ohio Expt. Sta.). (*Ohio Veg. and Potato Growers Assoc. Proc., 24 (1939), pp. 55–60*).—A general discussion, with special reference to virus diseases and to two diseases new to Ohio greenhouse plants, viz, the virus-induced Australian spotted wilt and bacterial stalk rot of tomato.

New equipment and new materials for controlling vegetable diseases, J. D. WILSON. (Ohio Expt. Sta.). (*Ohio Veg. and Potato Growers Assoc. Proc., 24 (1939), pp. 110–134*).—Progress in designing and construction of a much needed small power-driven spraying and dusting equipment for vegetable growers operating 5–20 acres is reported. The work on vegetable disease control involved comparisons of the insoluble copper compounds with one another and with bordeaux mixture, and progress along these lines is reported. As tested on tomatoes, there was little to choose between 4–4–50 and 4–2–50 bordeaux. Both formulas and Coposil all caused considerable injury to young plants. Bordeaux (4–4–50) and Grasselli Copper Compound-A gave the best control of anthracnose fruit rot on the canning crop. Sprays delayed until *Septoria* leaf spot appeared gave fair control and increased the yield of staked tomatoes. On cucumbers, those mixtures containing an insoluble copper as one ingredient gave better control of bacterial wilt than others in which these coppers were absent. A number of materials were tested on muskmelons, Cupro-K giving the best results on the basis of salable melons. The melons ripened later on many of the large, healthy vines treated with certain of the insoluble coppers. The results with potatoes, beans, celery, and carrots, though favorable from the standpoint of disease control and plant injury, made it seem inadvisable to recommend the use of insoluble coppers as bordeaux substitutes on these crops, largely due to the greater costs.

Injuries following greenhouse soil sterilization: Cause and control, I. C. HOFFMAN. (Ohio Expt. Sta.). (*Ohio Veg. and Potato Growers Assoc. Proc., 24 (1939), pp. 60–64*).—The accumulation of ammonium carbonate following soil sterilization—injurious to many plants—is reported preventable by application of $CaSO_4$.

A new disease of snap beans, W. A. JENKINS. (Ga. Expt. Stat.). (*Science, 90 (1939), No. 2325, p. 63*).—This severe chlorosis followed by wilt and death of the plant was first noted by the author in 1938, and during the current season has been even more destructive. The disease appears to have been brought in on western-grown seed and is believed not to have been hitherto described. The evidence thus far at hand suggests a virus origin.

Dwarfing of cucurbits sprayed with bordeaux mixture, J. G. HORSFALL, G. E. R. HERVEY, and R. F. SUIT. (N. Y. State Expt. Sta. et al.). (*Jour. Agr. Res.* [*U. S.*], *58 (1939), No. 12, pp. 911–927, figs. 7*).—Bordeaux mixture was found to induce six distinct types of injury on cucurbits, viz, dwarfing, leaf deformation, leaf-margin yellowing followed by necrosis, scorching of leaf lamina, accelerated transpiration, and defloration. The dwarfing and leaf-deformation aspects were studied in greenhouse tests during the winter and

some of the conclusions were checked during summer (1936–38). The lime portion of the bordeaux definitely dwarfed the plants and deformed the leaves, while the copper portion did not appear to be involved unless solubilized by low pH values. An increased spray load (amount of material per 50 gal. of spray, i. e., 2–2–50, 4–4–50, 6–6–50, etc.) increased the injury. The most significant factor in dwarfing and leaf deformation appeared to be the pH value of the spray. When it was shifted very far from neutral, dwarfing was increased whether or not copper was present. Based on the available data, it is suggested that the dwarfing may be due to (1) physiological drought in the tissues induced by the effect of bordeaux transpiration, (2) to the action of Ca ions in hardening the tissues, or (3) to reduced photosynthesis, or to a combination of these causes. Some of the so-called inert diluents caused injury to cucurbits. The safest diluents tried were diatomaceous earth, gypsum, talc, and wheat flour. Calcium arsenate appeared to be a satisfactory insecticide from the standpoint of safety. From the practical standpoint the data obtained indicate that both acid and alkaline sprays or dusts should be avoided on cucumbers and melons, and that a neutral bordeaux is impractical because the margin of safety is too narrow. "One of the insolubilized copper compounds would be preferable, although some of these are less satisfactory than others."

Studies on "damping off" of cultivated mushrooms and its association with Fusarium species, II, F. C. Wood (*Phytopathology, 29 (1939), No. 8, pp. 728–739, figs. 4*).—Continuing these studies (E. S. R., 77, p. 348), evidence is adduced to indicate that when the casing soil has been infested with *Fusarium* it is antagonistic to mushroom (*Agaricus*) spawn. It is further shown that, if due allowance be made for the large discrepancy in growth rates between *Fusarium* spp. and *Agaricus*, a well-established *Agaricus* culture is also intensely antagonistic to *Fusarium* spp. An antagonistic effect, its intensity depending on the time of inoculation, was shown by watering growing mushrooms with extract from cultures of *Fusarium* spp. grown in Richard's solution. The deleterious effects of oxygen deficiency on both fungus types is shown. The thermal death point of the common *Fusarium* species causing damping-off was determined, and it is suggested that soil sterilization is the best method known for avoiding this mushroom disease.

Movement of tobacco-mosaic virus in tomato plants, L. O. Kunkel (*Phytopathology, 29 (1939), No. 8, pp. 684–700, figs. 2*).—Under the experimental conditions, the virus never began movement out of inoculated tomato leaflets in 42 hr. or less, but occasionally moved throughout the stem of a plant in 44 hr., though the interval required varied greatly with different individuals. On first reaching the stem from an inoculated leaflet, the virus usually moved both upward and downward, though sometimes downward only and occasionally upward only. No evidence was obtained to support the idea that virus passage from an inoculated leaf to the tip of a plant is via the roots, and proof was given that it did not follow such a course in certain plants. When movement from an inoculated leaflet began, the virus traveled rapidly—sometimes at a rate of 7 in. or more per hour. Samuel's observations (E. S. R., 71, p. 337) that in the earliest stages of entering the stem virus particles may be separated by considerable distances was fully confirmed. The particles must pass through long chains of cells without infecting. This movement cannot, therefore, result from propagation by means of an autocatalytic reaction. Virus particles remaining for some time dormant in sections of tomato or tobacco stems may move out into plants grown from such sections and there multiply and cause disease.

Hybridization of a mosaic-tolerant, wilt-resistant Lycopersicon hirsutum with Lycopersicon esculentum, W. S. PORTE, S. P. DOOLITTLE, and F. L. WELLMAN. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 8, pp. 757–759, fig. 1*).—A recent introduction of *L. hirsutum* from South America produced a fertile hybrid on the Marglobe and Bonny Best varieties of tomato. This hybrid is of particular interest because *L. hirsutum* appears to be highly tolerant to tobacco mosaic virus and also resistant to wilt (*Fusarium bulbigenum lycopersici*).

Physiological drop in apples, L. R. DETJEN. (Del. Expt. Sta.). (*Md. State Hort. Soc. Proc., 41 (1939), pp. 20–26*).—A general discussion of fruit-bud initiation and development as depending on good culture, winter-killed and retarded buds, improper pollination, embryo abortion, the comparative significance of the several waves of drops when numbers alone and mass alone are considered, comparative importance of the physiological drop, and preripe drops.

Spraying of apples, with special reference to effects on foliage and fruit, L. A. STEARNS. (Del. Expt. Sta.). (*Md. State Hort. Soc. Proc., 41 (1939), pp. 57–62*).—A general discussion, with brief summary of recent data.

Unusual development of apple perennial canker following application of toxic wound dressings, E. L. REEVES, M. A. YOTHERS, and C. W. MURRAY. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 8, pp. 739–743, fig. 1*).—Of several hundred kinds of wound dressings tried, a few, applied to cleaned-out perennial canker lesions on Jonathan apple branches, caused injury to the bark surrounding the cankers, and *Gloeosporium perennans* invaded the bark so injured. Under average field conditions in north-central Washington, this fungus normally invades new bark tissues only during a relatively short period about the time tree growth starts and providing conditions are favorable for such development. The unusual feature here was the fact that the fungus advanced and fruited on the injured tissues during the hottest period of the year, at a time when it is difficult to obtain successful artificial inoculations and when, under ordinary circumstances, the pathogen is most inactive. The fungus also advanced into tissues containing a total average of 256 p. p. m. As_2O_3.

The effect of sulfur fungicides on the photosynthesis and respiration of apple leaves, R. A. HYRE ([*New York*] *Cornell Sta. Mem. 222 (1939), pp. 40, figs. 5*).—In these experiments (methods described), all spray materials used on McIntosh and Baldwin apple leaves under controlled conditions decreased the apparent photosynthesis during the test period (2½ days), the principal reduction due to lime-sulfur solution with or without lead arsenate occurring when the lower leaf surfaces were sprayed. The reduction from spraying both surfaces or the lower surfaces only was ±24 percent, and that from spraying the upper surfaces only was ±5 percent. The sprayed leaves throughout showed slight but not significant increases in respiration. The mean reduction in apparent photosynthesis (±10 percent) from four treatments (three sulfur-fungicide and one control) was essentially the same at 70° and 85° F., while that at 100° was ±25 percent—the last highly significant. At 85° bordeaux mixture gave less reduction in apparent photosynthesis than any of the sulfur sprays tested, the wettable sulfurs being next in order. Koppers Flotation Sulphur Paste gave the least reduction of the wettable sulfurs, and significantly less than the Magnetic Spray Wettable Sulphur. The other differences in wettable sulfurs were not significant. Lime-sulfur solution gave a significantly greater reduction in apparent photosynthesis than the wettable sulfurs. Lead arsenate added to two wettable sulfurs and to lime-sulfur solution gave a slightly greater but not significant mean reduction in apparent photosynthesis than these sprays without it. Addition of both hydrated lime and lead arsenate to these three sulfur sprays gave a greater mean reduction than without them

or with the lead arsenate alone, also differences not significant. Addition of Magnetic Catalytic Sulfur to lime-sulfur solution (1-100) plus lead arsenate gave the least reduction of all lime-sulfurs tested, but the number of replications was too small to indicate the significance. Addition of Magnetic Spray Wettable Sulphur to lime-sulfur solution (1-100) plus lead arsenate gave a slightly greater but not significant reduction than lime-sulfur (2-100) plus lead arsenate.

In this study the leaf treatments decreased the apparent photosynthesis and increased the respiration of Baldwin more than McIntosh leaves. The apparent photosynthesis of the untreated leaves was significantly less during the second 6½-hr. period of the day than during the first. Twenty-two references are included.

Relation of drought spot of prunes to boron content of fruit, E. C. Blodgett and W. E. Colwell. (Univ. Idaho). (*Phytopathology, 29 (1939), No. 7, pp. 650, 651*).—In this preliminary note drought injury to prunes, especially the spot form, is reported to be common and frequently serious in Idaho. Analyses of spotted and normal fruits indicated a definite correlation between such injury and a low boron content of the fruit and pit tissues.

Papaw mosaic disease, R. E. D. Baker (*Trop. Agr. [Trinidad], 16 (1939), No. 7, pp. 159-163, pls. 4, fig. 1*).—A general account (12 references), including symptoms, possible causes (probable virus etiology), work with insects (aleyrodid flies suspected as vectors), and control.

Some observations on psorosis in the light of experience of 25 years, J. C. Perry (*Calif. Citrog., 24 (1939), No. 8, pp. 276, 290, 291, 292, 293*).

Root-knot nematode injury restricted by a fungus, M. B. Linford and F. Yap. (Hawaii. Pineapple Prod. Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 596-609, fig. 1*).—Pineapple, *Ananas comosus* (Cayenne var.), slips were grown 15 mo. in pots of sterilized soil infested with *Heterodera marioni* larvae, both with and without cultures of five fungus species found to capture and kill various nematodes on agar. Heavy spontaneous infestations with such fungi (where no cultures had been added) prevented measurements of the full degree of beneficial effects of the introduced fungi, but the root knot injury as measured by leaf and root growth was significantly least where *Dactylella ellipsospora* had been added. The following fungi proved no more effective than the chance fungus infestation in which *D. ellipsospora* was dominant: *Arthrobotrys musiformis*, *A. oligospora*, *Dactylaria candida*, and *D. thaumasia*. Where added experimentally, each fungus dominated the chance contaminants and was reisolated from a large proportion of the pots after 15 mo.

The resistance of elms to Graphium ulmi [trans. title], G. Arnaud (*Ann. Épiphyt. et Phytogénét., n. ser., 5 (1939), No. 1, pp. 41-49, figs. 3*).—Experiments at Versailles are said to confirm the results reported by various investigators and to warrant the following conclusions: At the end of 10 yr. under test, 2 out of 50 seedling trees (*Ulmus campestris* forms) remained healthy under conditions very favorable to infection. The vigorous trees suffered relatively more after infection. Trees attacked only in their upper portions were cured by removal of affected parts and grew again vigorously, indicating that the basal parts were intact. However, such trees may be reinfected, there being no indication of immunity following attack. The role of *Scolytus* in transmitting *G. ulmi* generally accepted by most observers is considered possible, but certain doubts are raised concerning it.

Botrytis blight of Antirrhinum related to trichome disposition, F. P. McWhorter. (Oreg. Expt. Sta. and U. S. D. A.). (*Phytopathology, 29 (1939), No. 7, pp. 651, 652, fig. 1*).—In greenhouse plants of two varieties of *A. majus*, glandular trichomes are reported to have served apparently as effective courts

of infection, either because they retained moisture or because of some inherent property rendering them suitable media for the cinereal form of *Botrytis* concerned.

Anthracnose of Lippia, R. C. BAINES and C. B. CUMMINS. (Ind. Expt. Sta.) (*Phytopathology, 29 (1939), No. 7, pp. 654–656, fig. 1*).—*Sphaceloma lippiae* n. sp. is described on *L. lanceolata* collected at North Liberty, Ind. This species resembles *S. menthae* in habit, but has smaller conidia and differs in parasitism as proved by inoculations.

Studies on narcissus mosaic, F. A. HAASIS ([*New York*] *Cornell Sta. Mem. 224 (1939), pp. 22, pls. 2*).—This mosaic is said to be widely distributed, and its destructiveness is evidenced by the fact that diseased plants produce low-grade flowers and small, inferior bulbs. It is characterized by stunting, light green to greenish yellow striping, mottling, and marbling of the foliage and flower stem, by epidermal roughening of the foliage and occasionally of the flower stem also, by distortion of the foliage and occasionally of the flower parts, and by opaque, frostlike streaks and spots on the perianth and cup of the flower. Mosaic is due to a virus transmissible by bulb grafts, by mechanically injecting or rubbing sap from leaves of affected plants into or on leaves of healthy plants, and by propagation of mosaicked bulb stock, but probably not by soil contamination, by root contact, or through the seed. Transmission by root mutilation and by cutting or picking the flowers is said to be negligible. The symptom expression varies greatly among narcissus varieties, but intervarietal inoculations indicate that the disease is probably due to a single virus. The virus resists aging in vitro for at least 72 hr., is transmissible at a dilution of 1–100, is inactivated by 70°–75° C., and fails to pass Pasteur-Chamberland filters of grades L_3, L_5, and L_7. Based on morphological symptoms, plants other than narcissuses appear to be highly resistant or immune to this virus. Thus far the most satisfactory control method is to rogue and destroy affected plants or to protect healthy plants from inoculation by means of fine-mesh cheesecloth cages.

Phytophthora stem rot of Viscaria, R. C. BAINES. (Ind. Expt. Sta.). (*Phytopathology, 29 (1939), No. 7, pp. 652–654, fig. 1*).—The author describes the stem rot of *Lychnis viscaria* due to *P. cactorum*, which invades all the stem tissues. The fungus proved nonpathogenic on Grimes Golden apple trees, and thus differs in pathogenicity from the form of *P. cactorum* frequently isolated from apple trees and fruits in Indiana.

The effect of temperature and relative humidity on the powdery mildew of roses, K. LONGRÉE ([*New York*] *Cornell Sta. Mem. 223 (1939), pp. 43, figs. 13*).—Temperature effects on germination of the pathogen (*Sphaerotheca pannosa*) were studied on spores dusted on dry slides in moist chambers and on detached leaves floating on sucrose solutions. Excellent germination was obtained on slides provided certain strictly controlled humidity conditions were maintained, and it is shown that high germination is a matter of relative humidity and not the result of something peculiar to the leaf. Spore counts after 48 hr. at 18° C. and above and after 4 days below 18° indicated 3°–5° to be the minimum, 21° the optimum, and 33° the maximum for germination. At 3°–5° and at 30°–31° haustoria occasionally developed on detached leaves, but with no further growth, while at 33°–34° none were found. At 6°–10° mycelium was scant, at 11°–28° growth was good, and at 18°–25° it was optimum. No sporulation was found below 9°–10° or above 27°–27.5°. The greatest number of spores per conidiophore occurred at 21°–27.5°, but at 27.5° the number of conidiophores was scant. High germinability was reached at first at 27°–27.5°, but at 18°–19° the period of high germinability on a given leaflet

was longest. No true stimulative effect of temperature changes on germination was found. At 0° germinability was lost after 48 hr. At 21° preservation of germinability of detached spores depended largely on the relative humidity, decreasing rapidly as this was lowered, and in general the results were similar at 33°-34°.

Dusted on slides at 21°, a relative humidity of ±97-99 percent gave excellent germination, at 99.8-100 percent it was somewhat lower, at 95 percent it was very low, and at 75 percent there was no germination. Dusted on leaves of rose shoots at constant temperature, germination was reduced as the atmospheric humidity decreased, but, in general, spores on leaf surfaces germinated in what appeared to be a very dry atmosphere. Germination was higher on young than on old leaves, and the under surface was slightly more favorable than the upper. It is believed that cuticular rather than stomatal transpiration is the more important factor in relative humidity at the leaf surface. The evidence indicated that relative humidity at the leaf surface, especially of young leaves, is very high even in a dry atmosphere. As to mycelium on young leaves, decreasing relative humidity resulted in sparser development and fewer conidiophores, paralleling the effect on germination. Old leaves of the susceptible Excelsa variety were less susceptible than young leaves, and the upper surface less so than the lower, while old leaves of the Pernet variety were resistant under any condition. There was some evidence that the poorer germination of spores immersed in water as compared with those floating on the surface is due at least in part to deficient oxygen.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Contributions on wildlife research and management] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Res. and Mangt. Leaflets BS-115 (1938), pp. 6; BS-116, p. 1; BS-117, pp. 5, pl. 1; BS-118, pp. 35; BS-119, pp. 6; BS-120, pp. 8; BS-121, pp. 6, pls. 3; BS-122 (1939), pp. 13; BS-123, pp. 15, fig. 1; BS-124, pp. 7; BS-125, pp. 5; BS-126, pp. 7; BS-127, pp. [2], pls. 3; BS-128, pp. 2, pl. 1; BS-129, pp. 4; BS-130, pp. 3; BS-131, pp. 5, fig. 1; BS-132, pp. 5; BS-133, pp. 10; BS-134, pp. 9; BS-135, pp. 8; BS-136, pp. 18, figs. 2; BS-137, pp. 10, pls. 3*).—Further contributions in this series (E. S. R., 80, p. 365) are as follows: Cultural and Other Methods for the Control of Injurious Wildlife, by D. A. Spencer (BS-115); Suggestions for Control of Coccidiosis in Rabbits, by E. L. Vail (BS-116); Protecting Orchard Trees From Deer, by E. M. Mills (BS-117); Abstract of Fur Laws, 1938-39, by F. G. Grimes (BS-118); The Coordination of Mosquito Control With Wildlife Conservation, by C. Cottam (BS-119); Botulism, a Recurring Hazard to Waterfowl, With Notes on Recent Outbreaks in the United States, Canada, and Australia, by E. R. Kalmbach (BS-120); Two Home-Made Traps for English Sparrows (BS-121); Big-Game Inventory of the United States, 1937 (BS-122); Crow Damage to Fall Grain Crops in Oklahoma in 1937, With a Comparison of Field and Questionnaire Methods of Appraisal, by R. H. Imler and E. R. Kalmbach (BS-123); Factors in Nesting Losses of the California Valley Quail, by E. E. Horn (BS-124); Natural Plantings for Attracting Waterfowl to Marsh and Other Water Areas (BS-125); History and Significance of American Wildlife—II. Trends From Exploitation to Restoration, by H. P. Sheldon (BS-126) (E. S. R., 80, p. 365); An Efficient Trap for the Fox Ranch, by C. F. Bassett (BS-127); A Feeder for Foxes, by C. F. Bassett (BS-128); Cooperative Wildlife-Management Research, 1938 (BS-129); Seasonal Fox Rations and Quantities to Feed, by C. F. Bassett (BS-130); Suggestions on Attracting Birds, With References to Available Literature (BS-131); Some California Wild-

life-Forest Relationships, by E. E. Horn (BS-132); A Preliminary Investigation of the Food Habits of the Mourning Dove in Alabama, by W. Rosene, Jr. (BS-133); A Summary of the Gray Squirrel Investigation in Southeastern Ohio, by F. B. Chapman (BS-134); Personnel in Federal Game-Law Enforcement, by W. E. Crouch and C. A. Leichhardt (BS-135); The Waterfowl Situation, 1938-39 (BS-136); and Fall and Winter Food Habits of Deer in Northeastern Minnesota, by S. E. Aldous and C. F. Smith (BS-137).

The recent mammals of Idaho, W. B. DAVIS (*Caldwell: Caxton Printers, 1939, pp. 400, [pls. 2], figs. 33*).—The author recognizes 141 kinds of mammals, representing 6 orders, 20 families, and 55 genera, as found in Idaho. Fifty-seven percent of the forms recognized are rodents. Each form is treated separately as to name, type locality, distribution, diagnostic characters, and, where known, ecology. A 10-page list of references to the literature cited is included.

Distribution of mammals in the Japanese Empire, N. KURODA (*Jour. Mammal., 20 (1939), No. 1, pp. 37-50*).—This contribution is presented with a list of 38 references to the literature cited.

A parasitological reconnaissance in Alaska with particular reference to varying hares, C. B. PHILIP (*Jour. Mammal., 20 (1939), No. 1, pp. 82-86*).—A survey made in various points of Alaska during June and July 1937, with a view to detecting the possible occurrence of Rocky Mountain spotted fever virus in the rabbit tick, is reported. In the course of the survey, 172 varying hares were taken at various places in south-central Alaska and at Lake Bennett, Canada. The greatest density of population, "judged by numbers taken per unit of sampling time, appeared to be in the vicinity of Fairbanks. Tularemia was recovered from rabbit ticks in a very limited area near Fairbanks. The general scarcity of rabbit ticks and fleas makes it difficult to see how tularemia could soon be a factor, if at all, in extensive decimation of hares, although there appeared to be near-peak abundance of these animals in most of the areas visited."

Trapping moles, J. J. WOODS (*Canada Dept. Agr. Pub. 622 (1938), pp. 4, figs. 2*).

Reactions of muskrat populations to drought, P. L. ERRINGTON. (Iowa Expt. Sta.). (*Ecology, 20 (1939), No. 2, pp. 168-186*).—The author has found that "a large proportion of the muskrats resident in drying out habitats tend to stay in familiar home ranges, and, while they may suffer heavy or even annihilative mortality, they are usually more fortunate than the animals that attempt to go elsewhere. As vicissitudes become intensified, there is a conspicuous increase of intraspecific strife, vulnerability to predation (notably by mink), random and often lethal wandering, and, in winter, losses from hunger and cold."

Fall food habits of the raccoon in central Iowa, L. W. GILES. (Iowa Expt. Sta.). (*Jour. Mammal., 20 (1939), No. 1, pp. 68-70*).

Biographical sketch of Stuart T. Danforth, 1900-1938, A. WETMORE (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 23 (1939), No. 1, pp. 1-8*).—This biographical sketch includes a bibliography of the ornithological contributions by the late Dr. Danforth, largely based upon collections and observations made in the West Indies, compiled by the author and H. Friedmann.

The birds of Guadeloupe and adjacent islands, S. T. DANFORTH (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 23 (1939), No. 1, pp. 9-46*).—Of the 91 forms of birds known from the Guadeloupe and adjacent islands 88 are recorded from Guadeloupe, 2 for the first time.

The birds of Monserrat, S. T. DANFORTH (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 23 (1939), No. 1, pp. 47–66*).—From the island of Monserrat, 11 miles long and 7 miles wide and situated about 35 miles southeast of Guadeloupe, 58 species are recorded, 14 for the first time.

Food of some uncommon North American birds, C. COTTAM and P. KNAPPEN. (U. S. D. A.). (*Auk, 56 (1939), No. 2, pp. 138–169*).—This contribution presents such data as are available in the food habits laboratory of the U. S. D. A. Bureau of Biological Survey on the food of nearly 50 uncommon, vanishing, or extinct species of North American birds, with a bibliography of 44 titles.

Foods of bob-white in Wisconsin, P. L. ERRINGTON. (Iowa State Col.). (*Auk, 56 (1939), No. 2, pp. 170–173*).—The stomach contents of 58 bobwhites (*Colinus virginianus*) that were collected in Dane, Sauk, and Columbia Counties of Wisconsin between April 4 and November 28, 1930 and 1931, are reported upon. A report of earlier studies of the foods of the bobwhite in the north-central United States made during the winter months has been noted (E. S. R., 75, p. 804).

The comparative ability of the bob-white and the ring-necked pheasant to withstand cold and hunger, P. L. ERRINGTON. (Iowa Expt. Sta.). (*Wilson Bul., 51 (1939), No. 1, pp. 22–37*).—Field and experimental data from Iowa and Wisconsin, chiefly obtained between 1929 and 1934, are said to indicate that susceptibility to cold attending decrease in weight was usually much more pronounced in bobwhites than in ring-necked pheasants, and that the latter were also better able to retard and to endure starvation as well as to recover after temporary food crises. A list is given of 20 references to the literature cited.

The food of the giant toad (Bufo marinus (L.)) in Trinidad and British Guiana, with special reference to the ants, N. A. WEBER (*Ann. Ent. Soc. Amer., 31 (1938), No. 4, pp. 499–503*).—The results of examinations of the stomach contents of 26 specimens of *B. marinus* from Trinidad and British Guiana are reported. Thirty-five ant forms and 21 animals other than ants were identified.

The animals associated with edible fungi, C. A. THOMAS. (Pa. Expt. Sta.). (*Jour. N. Y. Ent. Soc., 47 (1939), No. 1, pp. 11–37*).—An annotated list, presented with a bibliography of seven pages.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 467–470*).—The contributions presented (E. S. R., 81, p. 539) are: Corrodentia as Pests of Ground Feed, by J. Hawkins (p. 467) (Maine Expt. Sta.); Introduced Pine Sawfly [*Acantholyda erythrocephala* (L.)], by C. L. Griswold (pp. 467, 468) (U. S. D. A.); Observations on the Potato Psyllid [*Paratrioza cockerelli* (Sulc.)] in Southwest Texas, by M. J. Janes (p. 468) (Tex. Sta); Notes on the Biology and Control of the Greenhouse Stone Cricket [*Tachycines asynamorus* Adel.], by I. G. Bue and J. A. Munro (p. 468) (N. Dak. Agr. Col.); New Mosquito Records from Key West, Fla., by F. W. Fisk (p. 469); Cryolite Dips as a Control Measure for the Corn Root Webworm on Newly Set Tobacco Plants, by L. B. Scott and J. Milam (p. 469) (U. S. D. A.); Transmission of the Narcissus Mosaic Virus by Aphids [Bean Aphid, Potato Aphid, *Marcosiphum rosae* (L.) and *Myzus convolvuli* (Kalt.)], by F. S. Blanton and F. A. Haasis (pp. 469, 470) (U. S. D. A. and Cornell Univ.); Distances Traveled by Newly Hatched Codling Moth Larvae, by L. F. Steiner (p. 470) (U. S. D. A.); and Fixation Method for Distinguishing Dead and Live Black Scale on Citrus, by J. F. Kagy, C. O. Persing, and K. E. Maxwell (p. 470) (Calif. Citrus Sta.).

[**Contributions on economic insects and insect control**] (*Peninsula Hort. Soc. [Del.] Trans., 52 (1938), pp. 68–76, 88–98, 103–120, 136–141, fig. 1*).—Contributions presented December 1938 included the following: What the Orchard Survey Disclosed in 1938, by E. N. Cory and C. Graham (pp. 68–76) (Md. Expt. Sta.); The Relation of Copper Fungicides to Lead Arsenate-Lime and Fixed Nicotine-Oil Sprays—1938 Results, by K. J. Kadow, S. L. Hopperstead, and M. W. Goodwin (pp. 88–98) (Univ. Del.); Spraying Experiences in 1938, by L. A. Stearns, D. MacCreary, and R. L. Pierpont (pp. 103–114) (Del. Sta.); and Spray Injury Studies in Maryland, by H. S. McConnell (pp. 115–117), Résumé of Japanese Beetle Retardation Work in Maryland for 1938, by G. S. Langford (pp. 118–120), and Practical Aspects of Pea Aphid Control, by L. P. Ditman (pp. 136–141) (all Md. Sta.).

Florida entomological conditions in 1938, J. R. WATSON (*Citrus Indus., 20 (1939), No. 2, pp. 11, 14*).

[**Work in economic zoology, entomology, and parasitology by the Hawaii Station**] (*Hawaii Sta. Rpt. 1938, pp. 43, 44, 75–82, 92–95, figs. 2*).—Reporting for the year (E. S. R., 79, p. 502) the work referred to includes a host list of the principal crop insects of Hawaii, by F. G. Holdaway; studies on the liver fluke *Fasciola gigantica* of cattle, with the longevity of liver-fluke cysts, the development of liver fluke in the final host, the life cycle of the intermediate snail host *Fossaria ollula*, and the longevity of liver fluke in cattle, all by J. E. Alicata, effects of liver flukes on milk production and body weight of dairy cows and prenatal infection of calves with liver flukes, both by G. W. H. Goo, L. A. Henke, and S. H. Work, treatment of fluke-infected cattle with Distol and with Kamala, both by Goo and Alicata, and treatment of a heifer with extract of male fern (Oleoresin of Aspidium), by Goo; prevalence of parasites in swine, by Alicata; poultry parasites, including relation of nutrition to ascarid infection and life history of the tapeworm *Hymenolepis exigua*, both by Alicata and Chang, and intermediate hosts of the cecal fluke *Postharmostomum gallinum*, additional intermediate hosts for the gizzard worm *Cheilospirura hamulosa*, and parasites of pigeons in Hawaii, all by Alicata; and rodent control, including poison bait, trap, and rat migration studies, by H. J. Spencer.

[**Work in entomology by the Idaho Station**] (Partly coop. U. S. D. A.) (*Idaho Sta. Bul. 229 (1939), pp. 28–30*).—The work of the year reported upon (E. S. R., 80, p. 70) relates to pyrethrum dust for *Lygus* control on alfalfa seed, rotenone for control of garden insects, dust and trap crops for pea weevil control, control of insects by parasites, codling moth control, identification of spider mites, and wireworm investigations.

[**Contributions on economic insects and insect control**] (*Ill. State Hort. Soc. Trans., 72 (1938), pp. 177–197, 385–395, 501–511, figs. 4*).—Contributions presented at conventions held in November 1938 and January 1939 include the following: 1938 Experiments in Codling Moth Control in the Eastern States, by W. P. Flint (pp. 177–182) (Ill. Expt. Sta. et al.); New Attacks on the Plum Curculio and Peach Borer, by S. C. Chandler (pp. 182–197); Apple Leafhopper, Leafroller, and Curculio Control in Apple Orchards, by W. P. Flint (pp. 385–395) (Ill. et al.); and 1938 Results with Lead Arsenate Substitutes, by M. D. Farrar, S. C. Chandler, D. Powell, and W. P. Flint (pp. 501–511).

[**Work in economic zoology and entomology by the Indiana Station**] O. W. FORD, G. A. FICHT, G. E. GOULD, G. E. MARSHALL, J. J. DAVIS, B. E. MONTGOMERY, P. LUGINBILL, E. V. WALTER, L. F. STEINER, J. E. FAHEY, and G. C. OBERKIRK. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1938, pp. 10, 50, 51, 52–58*).—Reference is made (E. S. R., 79, p. 649) to work of the year with the codling moth, European corn borer, cutworms, potato insects, tarnished plant

bug, cucumber beetles, cabbage insects, oriental fruitworm and parasites, apple leafhopper, cockroaches, hessian fly, white grub, corn earworm, forest insect survey, deciduous fruit insect investigations, and rodent control.

[Work with insects by the Nebraska Station] (*Nebraska Sta. Rpt. [1938], pp. 11, 12*).—The work of the year reported upon (E. S. R., 79, p. 504) includes control of the chinch bug, hessian fly, and flatheaded apple tree borer; and grasshopper control.

[Contributions on economic insects in British Columbia] (*Ent. Soc. Brit. Columbia, Proc., No. 35 (1939), pp. 5–8, 11–13, 15–19, 23–30, figs. 3*).—Among contributions presented (E. S. R., 80, p. 367) are the following: Insects Attacking Forest Products and Shade Trees in Washington and Oregon in 1937, by R. L. Furniss (pp. 5–8) (U. S. D. A.); A Note on Brine Flies in British Columbia (Ephydridae: Diptera), by I. J. Ward (pp. 11–13); Ectoparasites of Deer in British Columbia, by G. J. Spencer (pp. 15–19); The Scale Insects of British Columbia, by E. P. Venables (pp. 23, 24); Some Food Plants of Lepidopterous Larvae—List No. 6, by J. R. J. Llewellyn Jones (pp. 24–27); Phenomenal Infestation of Ectoparasites on Marmot, Weasel, and Packrat, by G. P. Holland (pp. 27, 28); and Notes on the Occurrence of *Grylloblatta campodeiformis* Walker in the Kalmoops District, by J. D. Gregson (pp. 29, 30).

***Report on the entomological division for the year 1937*, L. D. Cleare** (*Brit. Guiana Dept. Agr., Div. Rpts., 1937, pp. 83–88*).—This report relates particularly to work of the year with insects affecting sugarcane and means for their control (E. S. R., 80 p. 797).

***Pests and parasites*, J. C. F. Fryer and H. W. Miles** (*Jour. Roy. Agr. Soc. England, 99 (1938), pp. 380–414*).—Report is made on the important insect enemies of cereal, vegetable, and fruit crops and the progress of work with insecticides. A list is given of 101 references to the literature.

***Observations on parasitism and superparasitism* (Lepid.: Sphingidae; Hymen.: Braconidae, Chalcididae), C. B. Worth** (*Ent. News, 50 (1939), No. 5, pp. 137–141*).—In observations of parasitism at Swarthmore, Pa., the catalpa sphinx was found attacked by *Apanteles congregatus* to the extent of 83 percent in a single case. Likewise, "in a single case, larvae of *A. congregatus* were parasitized by a species of Chalcididae to the extent of 50 percent. *A. congregatus* usually lays about 60 eggs. The mortality of *A. congregatus*, before completing the reproductive cycle, is estimated at 94.3 percent." The species of Chalcididae mentioned is estimated to (1) experience a mortality twice as great as that of the braconid, or (2) lay only half as many eggs, or (3) lay half its eggs in caterpillars which have not been parasitized by braconids, or (4) be partially eliminated in some other way."

The influence of the quality of the food on the egg-production in some insects, J. K. de Jong (*Treubia [Buitenzorg], 16 (1938), No. 4, pp. 445–468, figs. 4*).—Report is made of experiments with *Epilachna*, *Helopeltis*, *Tinolius*, and *Diacrisia*. A list is given of 11 references to the literature.

Growth of insects with reference to progression factors for successive growth stages, F. H. Harries and C. F. Henderson. (U. S. D. A.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 4, pp. 557–572, figs. 4*).

An analysis of insect growth curves, L. C. Woodruff (*Jour. N. Y. Ent. Soc., 47 (1939), No. 1, pp. 47–55, figs. 4*).

Additional observations on the sleep of insects, P. Rau (*Ann. Ent. Soc. Amer., 31 (1938), No. 4, pp. 540–556, figs. 9*).—This contribution is presented with a bibliography of 107 titles.

The longevity of insects during complete inanition, N. S. R. Maluf (*Amer. Nat., 73 (1939), No. 746, pp. 280–285*).

Ageing of insects, L. O. Howard (In *Problems of Ageing: Biological and Medical Aspects*, edited by E. V. Cowdry. *Baltimore: Williams & Wilkins Co., 1939, pp. 53–70*).—This discussion is accompanied by a list of 42 references to the literature.

Insect aerial populations, H. E. McClure (Iowa State Col.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 4, pp. 504–513, figs. 5*).—The results of collections made daily with a net on the fender of an automobile from May 3, 1934, to May 11, 1935, in an attempt to determine the relative abundance of insects in the air at Horse Cave, Ky., and Danville, Ill., are reported.

The distribution of insects, spiders, and mites in the air, P. A. Glick (*U. S. Dept. Agr., Tech. Bul. 673 (1939), pp. 151, pls. 5, figs. 13*).—A report is made of collections of insects in the air by means of special traps fitted to the wings of various types of airplanes during the 5-yr. period from August 1926 to October 1931. During this period the traps were in operation for 1,007 hr. in 1,314 flights around Tallulah, La., and 44 flights around Tlahualilo, Durango, Mexico. Insects and spiders to the number of 30,033 were taken at altitudes ranging from 20 to 15,000 ft. Though taken in every month of the year, they were caught most abundantly in May, with the fewest number being taken in January and December. "Eighteen orders of insects and the orders of spiders and mites were collected. There were represented in the Louisiana collections 216 families, 824 genera, 4 new genera, 700 species, and 24 new species. The order Diptera was the most abundant order in the air, and nearly three times as many specimens were taken as of any other order. Coleoptera followed next after Diptera in the numbers taken. Homoptera and Hymenoptera were taken at 14,000 ft., the highest altitude at which insects were found. The highest altitude at which any specimen was taken was 15,000 ft., at which a spider was caught. The numbers of insects taken at different altitudes in 10 min. of collecting in the daytime were as follows: At 200 ft., 13.03 specimens; 1,000 ft., 4.70; 2,000 ft., 2.41; 3,000 ft., 1.35; and 5,000 ft., 0.64 specimens. For the night collections the figures are: At 500 ft., 15.31 specimens; 1,000 ft., 5.73; 2,000 ft., 2.52; 3,000 ft., 1.11; and 5,000 ft., 0.89 specimens. . . .

"There is much evidence to support the conclusion that many of the insects taken in the upper air were alive at the time they were collected. Many specimens were alive when removed from the screens. Among the most interesting of these was 1 mosquito, *Aedes vexans*, and a cicadellid, *Graphocephala versuta*, taken alive at 5,000 ft., a coccinellid, *Coleomegilla floridana*, at 6,000 ft., an aphid at 7,000 ft., and a small dermestid larva (*Trogoderma* sp.) at 9,000 ft. . . .

"Flights made over the flooded area of 1927 at Tallulah showed definitely that fewer insects were in the air at the lower altitudes. However, the numbers taken at 1,000 ft. and above were approximately the same as over nonflooded territory, indicating that insects flew or drifted in.

"In the airplane collections of insects in Mexico the pink bollworm moth was found as high as 3,000 ft. This and other studies all indicate that the pink bollworm moths are carried in the upper air currents for considerable distances.

"Modern aircraft offer a new source of danger in the dispersal and distribution of diseases and dangerous insect pests. During the 5 yr. of flying to collect insects many insects were found in the cockpits of the planes used, even during flight."

A list is given of 79 references to the literature cited.

Insects found on aircraft at Miami, Fla., in 1938, E. V. Welch (*Pub. Health Rpts.* [*U. S.*], *54 (1939), No. 14, pp. 561–566*).—A summary of insects found on aircraft arriving at Miami, Fla., from Central America, South America,

and Mexico from January 1 to December 31, 1938, is presented. It is pointed out that the inspection of all incoming aircraft from these countries, especially South America, is made primarily for the purpose of detecting the presence of live mosquitoes, particularly the yellow-fever mosquito.

[Contributions on alfalfa insects] (*Alfalfa Impr. Conf. Rpt., 6 (1938), pp. 7–12, 31–34*).—Contributions presented at the conference held in Manhattan, Kans., in June 1938 include the following: The Effect of *Lygus* Bugs and Other Factors on Seed Production, by J. W. Carlson (pp. 7–9); *Lygus* Investigations in the Southwest, by L. L. Stitt (pp. 9–12); Entomological Problems in Growing Alfalfa, by R. H. Painter (pp. 31, 32); and A Brief Survey of Insects Attacking Alfalfa in Kansas, by R. C. Smith (pp. 32–34).

Spiders and insects found associated with sweet corn, with notes on the food and habits of some of the species.—III, Hymenoptera. IV, Diptera and Hemiptera, R. T. Everly (*Ohio Jour. Sci., 39 (1939), No. 1, pp. 48–51, 52–56*).—A continuation of this contribution (E. S. R., 80, p. 795).

Rice field insects, W. A. Douglas. (Coop. U. S. D. A.) (*Louisiana Sta., Rice Sta. Bien. Rpt. 1937–38, pp. 17–19*).—The findings in rice field insect investigations during the period 1937–38, particularly with the rice stinkbug, the sugarcane borer, the rice stalk borer, and field infestation by stored rice insects, are summarized.

Common pests of grain and other stored produce, E. J. Butler et al. (*London: Dept. Sci. and Indus. Res., 1939, pp. VI+18, figs. [16]*).

Insect pests of cabbage and related crops, L. H. Shropshire (*Ill. State Veg. Growers' Assoc. Ann. Rpt., 8 (1938), pp. 41–44*).

Control measures for cucumber and cabbage insects, R. Hutson. (Mich. State Col.). (*Canner, 88 (1939), No. 17, pp. 22, 30; also in Fruit Prod. Jour. and Amer. Vinegar Indus., 18 (1939), No. 8, pp. 240, 246*).

Present status of scale and aphids and control, W. S. Hough. (Va. Expt. Sta.). (*East. Fruit Grower, 1 (1939), No. 12, pp. 4, 17, 19*).

Vapor-heat treatment for the control of narcissus bulb pests in the Pacific Northwest, R. Latta (*U. S. Dept. Agr., Tech. Bul. 672 (1939), pp. 54, figs. 34*).—The development of the vapor-heat method for Mediterranean fruitfly control in Florida led to work at Sumner in the Puyallup Valley of Washington to determine the adaptability of this method for thermal treatment of narcissus bulbs for pest control in the Pacific Northwest as an alternative to the hot-water method.

"In the experimental work it was determined that a treatment temperature of 110° to 111° F. was the most favorable. This temperature has been used as a standard in the hot-water treatment also. The minimum durations at this temperature necessary for complete mortality of the insects and mites were determined as follows: Narcissus fly 1½ hr., lesser bulb flies 1½ hr., bulb scale mite ½ hr., [and] bulb mite ½ hr. In the experimental results thus far obtained almost complete control of the bulb nematode has been produced by 8-hr. treatments at 110° to 111° during the earlier part of the storage season. When bulbs are intended for greenhouse-flower production, satisfactory results may be obtained by treating the bulbs for not more than 2 hr. at 110° to 111° for insect and mite control, during the first half of August, after at least 3 weeks of drying. Attention must be given to varietal differences in tolerance. Poetaz, poeticus, polyanthus, and tazetta types respond favorably only to early-season treatments. Bulbs intended for field planting for bulb production tolerate treatments of long duration, and the effect on flowers is not associated with the effect on bulb increase. Although the period during which treatments may be given with satisfactory results was found to be extensive, the prelim-

inary results obtained in the nematode-control studies indicate that treatment should be given soon after the bulbs are dug. For planting stocks the 8-hr. duration at 110° to 111° necessary for nematode control is desirable as a protective measure. Bulbs may be treated in consecutive seasons without fear of detrimental effects. Ceresan treatment for control of basal rot is compatible with vapor-heat treatment. When properly applied, vapor-heat treatment of planting stocks may be expected to result in vigorous growth and an above-normal increase in bulb production."

Preparation of calcium arsenates of low solubility, O. A. NELSON. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 370-372, fig. 1*).—Investigations reported reveal that by proper control of conditions calcium arsenates can be prepared that are uniform in composition, basicity, and soluble As_2O_5.

Terpene ethers in pyrethrum and rotenone fly sprays, R. L. PIERPONT (*Delaware Sta. Bul. 217 (1939), pp. 59, figs. 18*).—Following a brief introduction and description of materials report is made of toxicity tests (pp. 8-55) conducted, the details of which are given in 33 tables and 18 figures, and of physiological tests (pp. 56, 57), of ethylene glycol ether of pinene. The most effective of the various synthetic terpene ethers investigated, namely, ethylene glycol ether of pinene (D. H. S. Activator), was found to be relatively toxic to houseflies and also an effective activator for pyrethrum and rotenone in fly sprays and can be safely and economically included in commercial fly sprays. "A marked increase in the insecticidal action of solutions containing 50, 75, 100, 125, and 150 mg. pyrethrins, respectively, per 100 cc. in a petroleum oil base was obtained by the addition of 2.5, 5, 7.5, and 10 percent of D. H. S. Activator. The 'kill' was increased approximately 10 percent for each 2.5 percent of Activator added. Combinations of pyrethrum and D. H. S. Activator display the rapid, toxic action of both ingredients, there being no significant mortality after 24 hr. D. H. S. Activator reduced the 'knockdown' time of pyrethrum in sprays in relation to the amount added, that is, the more Activator, the quicker the knockdown. A straight pyrethrum fly spray (100 mg. pyrethrins per 100 cc.) in a petroleum oil base and the same spray containing various amounts of D. H. S. Activator were stored in airtight tin cans at room temperatures ranging from 70°-80° F. for a period of 22 mo. without any loss in toxicity or reduction in the activation effect. . . . The insecticidal action of solutions containing 50 and 100 mg. rotenone, respectively, per 100 cc. and 7.5 percent safrole in a petroleum oil base was also increased by the addition of 2.5, 5, 7.5, and 10 percent of D. H. S. Activator. The increases were less than with pyrethrum fly sprays, approximating 5 percent for each 2.5 percent of Activator added. The 24-hr. mortality for rotenone fly sprays was increased by the addition of D. H. S. Activator without any significant reduction in the 24- to 48-hr. mortality characteristic of them. As with pyrethrum fly sprays, D. H. S. Activator reduced the knockdown time of the rotenone-safrole combinations in relation to the amount added, that is, the more Activator the quicker the knockdown."

Studies with dinitro-o-cyclohexylphenol, A. M. BOYCE, J. F. KAGY, C. O. PERSING, and J. W. HANSEN. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 432-450, figs. 3*).—Studies of dinitro-o-cyclohexylphenol, which has been used in insecticide investigations in California since 1935, and particularly certain of its physical and chemical properties that may concern its use on citrus and certain other plants, are reported. "A satisfactory colorimetric method of analysis has been developed. The solubility of the dinitro-o-cyclohexylphenol in various organic solvents, including petroleum spray oils, and in water has been determined. The solubility of the compound in

water increases with a rise in pH. The distribution of the compound between the oil and aqueous phases of spray emulsions has been investigated. In acidified emulsions (pH 3.5 to 5.0) over 90 percent of the compound remains in the oil phase at equilibrium. In alkaline waters (pH 8.0 to 11.0) less than 5.0 percent of the compound remains in the oil phase. The phase distribution of dinitro-*o*-cyclohexylphenol greatly affects the toxicity of emulsions containing this compound to the eggs of the citrus red mite (*Paratetranychus citri* (McG.)) and to the eggs of the plant bug *Lygaeus kalmii* Stal. Field investigations have shown that certain oil emulsions containing dinitro-*o*-cyclohexylphenol are effective in the control of the black scale (*Saissetia oleae* (Bern.)), the citricola scale (*Coccus pseudomagnoliarum* (Kuw.)), the citrus red mite (*P. citri*), the citrus whitefly (*Dialeurodes citri* Ashm.), the European elm scale (*Gossyparia spuria* (Mod.)), the walnut scale (*Aspidiotus juglans-regiae* Comst.), and the frosted scale *Lecanium pruinosum* Coq.

"An investigation concerned with the use on citrus of dinitro-*o*-cyclohexylphenol in certain water-insoluble organic solvents other than petroleum oil has shown that emulsions of these solutions are appreciably toxic to the black scale. Tree-tolerance experiments showed that there was a direct relation between the boiling point of the solvent and the degree of injury resulting from these spray mixtures on citrus. The effectiveness of aqueous solutions of dinitro-*o*-cyclohexylphenol for the control of the black scale on citrus has been investigated during the last 2 yr. In this connection the sodium and triethanolamine salts have offered promise. Physical properties and methods of preparation of these salts as related to field usage have been studied. Field results indicate that aqueous sprays containing 0.035 percent dinitro-*o*-cyclohexylphenol in solution as the sodium or triethanolamine salt will afford satisfactory control of the black scale on citrus. Colloidal dispersions of this compound prepared and used in several ways have afforded high mortalities of the black scale and of eggs of the citrus red mite. A dust mixture which contains 1 percent of this compound incorporated in either walnut-shell flour or redwood-bark flour has proved to be an effective acaricide for the control of the citrus red mite on citrus and the common red spider (*Tetranychus telarius* (L.)) on Persian walnuts. Experiments on the control of the orange tortrix (*Argyrotaenia citrana* (Fern.)), the citrus thrips (*Scirtothrips citri* (Moult.)), the greenhouse thrips (*Heliothrips haemorrhoidalis* (Bouché)), and red scale *Aonidiella aurantii* (Mask.), have shown that the compound is toxic to these insects, but for various reasons its use is not likely to be practical under field conditions. Considerable attention has been directed to the phytocidal action of this compound when applied to citrus and other plants under a wide range of meteorological conditions in various insecticidal combinations. Although dinitro-*o*-cyclohexylphenol may cause injury to citrus and other subtropical plants under certain conditions, the indications are that it can be used with comparative safety on these plants, especially in dust mixtures and possibly in aqueous dispersions. The relation of dinitro-*o*-cyclohexylphenol to public health has been considered. Available evidence does not indicate the existence of a problem in this regard."

Dinitro-o-cyclohexylphenol in the control of mites on citrus and Persian walnuts, A. M. Boyce, D. T. Prendergast, J. F. Kagy, and J. W. Hansen. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 450–467, figs. 6*).—Work on the chemical control of mites, conducted in connection with that above noted, is reported, the details being given in tables and charts. In field work in 1937 "a properly prepared solvent-mix dust consisting of 1 percent dinitro-*o*-cyclohexylphenol in walnut-shell flour gave promising results for control of the citrus red mite. . . . A proprietary product registered in California

as DN Dust was made available for limited commercial usage in April 1938. Over 1 million pounds have been applied commercially by the manufacturer under a wide variety of conditions. Improved dusting equipment was devised to insure more thorough application of dust insecticides on citrus. The dosage of DN Dust for a mature tree varies in accordance with the presence of fruits that are approximately one-half of full size or larger, the presence of moisture on the trees at the time of application, and the density of tree foliage. A dosage of 1 lb. of DN Dust per tree when only young fruit is present appears adequate under most conditions. In the presence of larger fruit the dosage must be increased to 1.5 or 2 lb. per tree. If moisture is present at the time of application, this dosage may be reduced by approximately 25 percent. When the foliage is less dense, particularly in the case of lemons, the dosage must be increased. A program consisting of two properly synchronized applications is most dependable in effecting control, although one application has, in some localities, afforded very satisfactory control for periods of several months and longer.

"It has been found that DN Dust can be used with comparative safety on citrus. The most important factor relating to injury appears to be the incidence of high temperatures occurring within a period of 2 days after application. By not applying the DN Dust when temperatures above 95° F. are forecast, this injury has been of negligible economic importance. . . . DN Dust has been used on peaches and almonds infested with common red spider and the clover mite (*Bryobia praetiosa* Koch), high mortalities having been obtained in all instances. No injury to the trees has been observed. . . . There appears to be no significant public health hazard involved in the use of this preparation either to the operators who apply the dust or to the consumers of treated fruits."

Agar-agar, a new activator for nicotine sprays, S. S. Sharp. (La. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 394, 395*).—In experiments with the pea aphid it was shown that "agar-agar trebled the effectiveness of nicotine sprays on the pea aphid. The activation by agar-agar was equal to that produced by karaya gum. Both agar-agar and karaya gum are difficult to disperse in water and are unsatisfactory for general use in sprays. The dispersal of karaya gum is materially assisted by the use of alcohol and light mineral oils, whereas agar-agar is best dispersed by boiling in water."

Fluorine spray residue removal with dilute solutions of hydrochloric acid, boric acid, and sodium chloride, E. H. Karr (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 423–430, figs. 2*).—In work reported it was found that in the removal of "fluorine spray residues from apples with a single process, overhead flood-type fruit washer, the presence of 2 percent boric acid in a 1.5 percent solution of hydrochloric acid at a temperature of 100° F. was only slightly, if at all, more effective than the hydrochloric acid solution alone. The effectiveness of a 1.5 percent solution of hydrochloric acid containing 2 percent boric acid was reduced considerably by the presence of 1 percent sodium chloride at a solution temperature of 100°. When the temperature of the hydrochloric-boric acid solution containing 1 percent sodium chloride was increased to 110°, the depressing action of the sodium chloride was prevented."

Effect of insect residues and other factors on removal of spray residues from apples, H. C. McLean and A. L. Weber. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 357–360*).—In many New Jersey orchards residue removal has been frequently found to be more difficult from certain apples than from others, even though the fruit had been similarly sprayed and contained equal amounts of residue. Two important factors are responsible for these variations—(1) insect residues and (2) differences in the conditions of the foliage on the trees. Another factor influencing removal of spray residues is the

sticker and spreader used in the spray mixtures, especially when an oil plus lead arsenate spray schedule is followed. Investigations in a number of orchards have shown that fungus growth occurring on the honeydew secreted by insects, especially leafhoppers, caused difficulty in the removal of lead residues from apples. For a given spray treatment the apples from trees with heavy, luxuriant foliage were much easier to wash than those from trees with light foliage. "The spreader and sticker employed with lead arsenate, especially in summer oil spray mixtures, have an important influence on the spray residue removal from the picked fruit. Of several materials compared as to their relative effects on deposits and retention of lead arsenate, as well as their influence on removal of residues, Orthex had the desirable qualities of producing a heavy coating and of being removed without difficulty in washing."

Psocids in dwellings, E. A. Back. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 419–423*).—A practical summary, including notes from correspondence relating to psocids in various parts of the country.

The biology of the American cockroach, G. E. Gould and H. O. Deay. (Ind. Expt. Sta.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 4, pp. 489–498, fig. 1*).—Observations made under ordinary room conditions, which extended over a 3-yr. period, are reported.

Painting for determination of grasshopper flights, H. R. Willis (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 401–403*).—Trials to determine the migratory habits, including the direction, distance, and time of flights, of *Dissosteira longipennis* (Thos.) and *Melanoplus mexicanus* (Sauss.), first carried on with *D. longipennis* in Colorado in 1937 and with *M. mexicanus* in Montana in 1938, are reported. A lacquer paint which had additional amyl acetate added at the rate of four parts to one of paint used was found to be satisfactory in marking grasshoppers without injuring them or retarding their flight movement. It is concluded that there are definite directions of flights of these species, and that "these directions, distances, and times involved for covering these distances can be determined by painting large numbers of grasshoppers in their hatching grounds and following their migrations through tracing the captured specimens."

The white fungus disease (Beauveria bassiana) among red locusts in South Africa and some observations on the grey fungus disease (Empusa grylli), E. E. Schaefer (*Union So. Africa [Dept. Agr. and Forestry], Sci. Bul. 160 (1936), pp. 28, pls. 11*).—A report of work with two important entomogenous fungi.

Two new Thysanoptera from Florida, J. R. Watson and J. R. Preer. (Fla. Expt. Sta.). (*Fla. Ent., 22 (1939), No. 1, pp. 1–5, figs. 2*).—*Sophiothrips bicolor* and *Eurythrips robustisetis*, both from dead leaves under live oaks, are described as new.

Thysanoptera from northern New Jersey, with descriptions of new species, J. C. Crawford. (U. S. D. A.). (*Jour. N. Y. Ent. Soc., 47 (1939), No. 1, pp. 69–81*).—A list given of 71 forms of thrips known to occur in New Jersey is followed by descriptions of 4 new species.

Notes on some thrips collected in the vicinity of Babylon, Long Island, N. Y., F. S. Blanton. (U. S. D. A.). (*Jour. N. Y. Ent. Soc., 47 (1939), No. 1, pp. 83–94*).—Species collected near Babylon during the course of investigations of the spread of a virus disease of narcissus are noted.

Notes on pamera populations on various types of plant communities in the vicinity of Plant City, J. W. Wilson (*Fla. Ent., 21 (1938), No. 2, pp. 28–30*).—Notes are presented on three species of lygaeids, namely, *Orthaea longulus* (Dallas), *O. vincta* (Say), and *O. bilobata* (Say), found on strawberry plants and

other vegetation that forms a heavy growth near the ground in the strawberry-growing section near Plant City, Fla. Of the three species, *O. bilobata* was by far the most abundant.

Biological notes on Blissus iowensis Andre (Hemiptera—Lygaeidae), G. C. DECKER and F. ANDRE. (Iowa Expt. Sta.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 4, pp. 457–466, figs. 2*).—It is concluded that since *B. iowensis* feeds largely upon a wild grass (*Andropogon scoparius*), which is no longer abundant or of great economic value, the species is not likely to assume a position of economic importance.

The use of heavy naphtha in bed-bug disinfestation, B. T. J. GLOVER (*Jour. Roy. Sanit. Inst., 59 (1939), No. 11, pp. 671–682*).—Commercial heavy naphtha was found to be effective in the eradication of bedbugs from empty dwelling houses, a second application having been necessary in but 6 out of 1,494 dwellings thus treated for the destruction of the eggs and the adults.

A new froghopper pest of sugar-cane, A. PICKLES (*Trop. Agr. [Trinidad], 16 (1939), No. 4, p. 84*).—A severe outbreak of the froghopper *Tomaspis guppyi* in Trinidad in January 1939 is reported. Its injury was quite severe on Co. 213 cane, which is generally resistant to attack by the common froghopper.

Three new species of psyllids and the description of the allotype of Livia opaqua Cald. (Homoptera: Psyllidae), J. S. CALDWELL. (Ohio State Univ.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 4, pp. 442–444, fig. 1*).

The toxicity of derris to larvae of the citrus whitefly, L. L. ENGLISH. (Ala. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 360–363, figs. 6*).—In the experiments reported, dilute oil emulsions were shown to be effective supplements for derris applied against larvae of the citrus whitefly. "The efficiency of the emulsions for this purpose varied greatly with the emulsifying agent used. With an 83 viscosity oil, powdered skim milk produced a more effective emulsion than diglycol laurate, but a greater proportion of the kill obtained with the skim milk emulsion was due to the oil itself, rather than to the derris. An experiment with extracted and unextracted derris showed that derris was a true toxic agent to citrus whitefly larvae. The data also indicated that derris may be physically antagonistic to the insecticidal action of dilute emulsions."

A further contribution to the ecology of Aleurodes brassicae Walk. (Hemiptera), C. G. BUTLER (*Roy. Ent. Soc. London, Proc., Ser. A, 13 (1938), No. 10–12, pp. 161–172, fig. 1*).—A contribution mainly concerned with the relationship of *A. brassicae* and the physical factors of its environment.

Food-plant catalogue of the aphids of the world, including the Phylloxeridae, E. M. PATCH (*Maine Sta. Bul. 393 (1938), pp. 35–431*).—This is a compilation from aphid literature of the known food plants of Aphididae of the world. The aphid forms appear under the plant families in alphabetical order, each followed by a reference to the literature and the host species. The food plant catalog includes a bibliography (pp. 266–320), an index to plant families (pp. 321–327), and an index to aphids (pp. 329–430).

The digestive system of Macrosiphum solanifolii (Ash.) (Aphidae: Homoptera), C. F. SMITH. (Ohio State Univ.). (*Ohio Jour. Sci., 39 (1939), No. 1, pp. 57–59, figs. 4*).—A study of the internal anatomy of this aphid.

Studies on pea aphid control, L. P. DITMAN. (Univ. Md.). (*Canning Trade, 61 (1939), No. 40, p. 7*).—A brief report is made of the progress of a 5-yr. experiment, commenced in 1938 at Ridgely, Md., primarily to determine the extent of pea aphid infestations on the Eastern Shore and the practicability of annual treatment for the insect.

Aphids of the genus Kakimia infesting ribes (Homoptera), G. F. KNOWLTON and M. W. ALLEN. (Utah Expt. Sta.). (*Ent. News, 50 (1939), No. 6, pp.*

166–170, figs. 2).—Seven species of the aphid genus *Kakimia* H. and F. that attack currants and gooseberries, one of which, *K. muesebecki*, from Redwood Canyon, Calif., is new to science, are considered.

Distribution of intermediate-winged aphids in the family and its bearing on the mode of their production, A. F. Shull. (Univ. Mich.). (*Amer. Nat., 73 (1939), No. 746, pp. 256–269, figs. 2*).

Spraying woodlands with an autogiro for control of the gypsy moth, S. F. Potts. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 381–387, figs. 5*).—This contribution is based upon spraying experiments with an autogiro at Freetown, Mass., in 1936 in control of the gypsy moth, the data being given in table form. The work "demonstrated the possibility of using this type of aircraft for the control of certain leaf-eating forest insects where the contour and regularity of the land is favorable."

The sources of Ephestia infestation of stored cacao in Ceylon, M. Fernando (*Trop. Agr. [Ceylon], 92 (1939), No. 3, pp. 141–155*).—Report is made of methods employed and results obtained in an investigation of the sources of *Ephestia* infestation of stored cacao in Ceylon.

Larva of Ephestia kulniella [kuehniella] in the egg of a hen, F. R. Beaudette. (N. J. Expt. Stas.). (*Indian Vet. Jour., 15 (1939), No. 4, p. 365*).

Cankerworms, T. H. Jones (*U. S. Dept. Agr. Leaflet 183 (1939), pp. 8, figs. 5*).—A practical account.

The cherry casebearer (Coleophora pruniella Clem.) in Oregon, T. Y. Hsiao and D. C. Mote. (Oreg. State Col.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 363–365*).—A brief account of the cherry casebearer, first discovered in Oregon in the spring of 1937, since which time it has become the source of rather heavy damage in apple orchards near Salem. In the course of cage observations the two hymenopterous parasites *Eurydinota lividicorpus* Gir. and *Microbracon pygmaeus* (Prov.) were reared.

The tomato leaf miner and its control, M. Cohen (*Jour. Min. Agr. [Gt. Brit.], 45 (1938), No. 5, pp. 460–462, pl. 1*).—A brief account is given of observations made in 1937 of *Liriomyza solani*, Macq., which first appeared in British greenhouses in 1926, as reported by E. R. Speyer,[4] and is causing some injury to tomatoes in the British Isles.

The metabolism of the corn ear worm.—II, Glycogen and moisture, L. P. Ditman and G. S. Weiland. (Univ. Md.). (*Ann. Ent. Soc. Amer., 31 (1938), No. 4, pp. 578–587, figs. 6*).—A continuation (E. S. R., 79, p. 510).

The effects of neutral copper fungicides on tank-mix nicotine-bentonite in control of the codling moth, L. F. Steiner and J. E. Fahey. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 365–369, fig. 1*).—Of five neutral copper compounds tested in the Midwest where they are necessary for the control of certain apple diseases, each reduced the resistance of nicotine deposits to the weathering effects of heavy rains and also reduced the effectiveness of "tank-mix-nicotine-bentonite in codling moth control. There was also evidence that at least one substantially depressed the toxicity of the nicotine deposit. All five copper compounds produced very serious foliage injury, and two used early in the season caused severe russeting and cracking of Grimes fruit. Foliage injury from copper, however, was also produced in 1938 by applications of ¾–1½–100 bordeaux mixture with lead arsenate."

Distribution of codling moth worms on apple trees as influenced by banding, A. M. Woodside. (Va. Expt. Sta.). (*Va. Fruit, 27 (1939), No. 3, pp. 22, 24, fig. 1*).—It was found in 1938 upon removal of codling moth bands from

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[4] Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 22 (1936), p. 70.

apple trees in a heavily infested orchard near Staunton that about 70 percent of the worms cocooned on banded apple trees cocooned in the bands. More than 50 percent of the worms on the branches were in pruning wounds and in cracks in dead wood. Splintered stumps of broken branches harbored many of these. In a tree on which 321 worms and cocoons were found, more than 200 were in pruning scars and stumps of broken branches. The indication that about three-fourths of the worms on the older trees are to be found on the branches emphasizes the importance of scraping those parts as a control measure.

Trapping codling moth larvae with treated corrugated paper bands, A. M. WOODSIDE. (Va. Expt. Sta.). (*Better Fruit, 33 (1939), No. 11, pp. 3, 8, 14, 15, fig. 1*).

Relation of number of European corn borers per infested corn plant to percentage of plants infested, L. H. PATCH. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 387–393, fig. 1*).—Data presented give the estimated numbers of European corn borer larvae per infested cornstalk in fields of dent corn surveyed in each of the annual State surveys to determine the abundance of the borer in Ohio, Michigan, and New York from 1926 to 1936, inclusive. "When 2 percent of the stalks were infested the number of borers per infested stalk ranged from 0.8 to 2.2 and averaged 1.34. Comparable data when 25 and 62 percent of the stalks were infested showed that the numbers of borers ranged from 1.17 to 2.80 and from 1.7 to 3.9 and averaged 1.89 and 2.81, respectively."

A contribution to the knowledge of the mosquitoes of Owens Valley, Inyo County, Calif., T. H. G. AITKEN. (Univ. Calif.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 407–412*).—This contribution relates to observations on seven species present or approximately in Owens Valley, namely, *Anopheles maculipennis* Meig., *A. punctipennis* (Say), *A. pseudopunctipennis* Theob., *Theobaldia inornata* (Will.), *T. maccrackenae* (Dyar & Knab), *Culex tarsalis* Coq., and *Aedes dorsalis* (Meig.).

A design of flushing siphon for control of anopheline breeding, G. MACDONALD (*Jour. Malaria Inst. India, 2 (1939), No. 1, pp. 63–69, pls. 4, fig. 1*).—A description is given of the design of a flushing siphon, used in control of anopheline breeding, which gives an automatic discharge of 475 gal. of water a minute.

The effect of certain chemicals on the hatching of mosquito eggs, C. M. GJULLIN, W. W. YATES, and H. H. STAGE. (U. S. D. A.). (*Science, 89 (1939), No. 2319, pp. 539, 540*).—The authors' findings indicate that the amino acids and proteins present in vegetation may be the stimulants which cause the hatching of mosquito eggs when flooded in nature.

New Jersey Mosquito Extermination Association, twenty-fifth annual meeting (*N. J. Mosquito Extermin. Assoc. Proc., 25 (1938), pp. 11–48, 51–57, 79–100, 106–197, 209–232, pls. 7, figs. 4*).—Contributions presented at the annual meeting of the association held at Atlantic City in March 1938 (E. S. R., 79, p. 367) include the following: Summary of Mosquito Control Work in New Jersey in 1937, by T. D. Mulhern (pp. 11–48) (N. J. Expt. Stas.); Comparison of Mosquito Repellency Tests Under Laboratory and Field Conditions, by P. Granett (pp. 51–57) (Rutgers Univ.); Review of Advances in Practical Methods of Mosquito Control, by F. A. Reiley and R. L. Vannote (pp. 79–84); Review of Advances in Scientific Mosquito Knowledge, by J. G. Lipman (pp. 84–88), and Review of Economic Results of Mosquito Control, Work Accomplished, [and] Benefits Derived From the Mosquito Association, by T. J. Headlee (pp. 88–100) (both N. J. Stas.); New Developments in Mosquito Control in Connecticut, by R. C. Botsford (pp. 106–108) (Conn. [New Haven] Sta.), in Rhode Island, by M. H. Price (pp. 111–115), in Delaware County,

Pa., by R. L. Mentzer (pp. 125–130), and in Delaware, by W. S. Corkran (pp. 130–137); Mosquito Control in Massachusetts During 1937, by G. R. Stratton (pp. 108–111), in Greater New York, by S. Pincus (pp. 115–121), in Suffolk County, N. Y., by B. M. Mitchell (pp. 121–124), and in the Pacific Northwest, by H. H. Stage (pp. 188–197) (U. S. D. A.); Data Compiled for Mosquito Work in Virginia, by R. E. Dorer (pp. 137–139); Mosquito Control as Related to Marsh Conservation, by J. L. Clarke (pp. 139–147); Economic Importance of Malaria Control, by L. L. Williams, Jr. (pp. 148–152); A Review of Mosquito Work Throughout the World in 1937, by F. C. Bishopp and J. L. Webb (pp. 152–176) (U. S. D. A.); Mosquito Suppression Work in Canada in 1937, by A. Gibson (pp. 176–185); Problems of Mosquito Control in the Passaic Valley, by A. R. Cullimore and R. L. Vannote (pp. 185–188); Factors Affecting the Vegetative Cover of Delaware Marshes, by F. C. Daigh, D. MacCreary, and L. A. Stearns (pp. 209–216) (Del. Sta.); The Coordination of Mosquito Control with Wildlife Conservation, by C. Cottam (pp. 217–227) (U. S. D. A.); and Heartworm in Dogs—A Mosquito-Borne Menace in New Jersey, by T. C. Nelson and M. L. Morris (pp. 227–232) (Rutgers Univ. et al.).

Report of the Suffolk County Mosquito Extermination Commission, L. W. Ruland et al. (*Riverhead, N. Y.: Suffolk Co. Mosquito Extermin. Comn., 1938, pp. 31, [figs. 10]*).—A report of control work with mosquitoes in Suffolk County, Long Island, N. Y.

Ammonium sulphate as a combined fertilizer and mosquito larvicide, C. J. H. Brink and D. K. Das Chowdhury (*Jour. Malaria Inst. India, 2 (1939), No. 1, pp. 111, 112*).—Experiments conducted led to the general conclusion that while solutions of ammonium sulfate in strengths of 0.75 percent and over will prevent mosquito breeding, the recurring cost of the method renders it unsuitable for use in large irrigation areas.

A new gall midge on rhododendron, E. P. Felt (*Jour. N. Y. Ent. Soc., 47 (1939), No. 1, pp. 41, 42*).—Under the name *Giardomyia rhododendri* a description is given of a new gall midge reared by the New Jersey Experiment Stations from larvae commonly infesting the young tips of rhododendron in a nursery at Huntington Station, Long Island, N. Y.

A new juniper midge (Diptera: Cecidomyiidae), E. P. Felt (*Ent. News, 50 (1939), No. 6, pp. 159, 160*).—Under the name of *Contarinia juniperina*, the author describes a new species which caused serious injury to juniper twigs in the Midwest during the summer of 1938.

On flies as intermediate hosts of Syngamus trachea, P. A. Clapham (*Jour. Helminthol., 17 (1939), No. 2, pp. 61–64*).—Flies, including the housefly and the sheep blowfly *Lucilia sericata*, reared from larvae that had ingested rabbit flesh infected with gapeworm eggs, were fed both as grown larvae and as adults to chickens that were 6 days old. "When samples from each group were dissected, it was found that the eggs had been taken up and were still alive. The larvae had found their way to the fat body surrounding the gut where they were lying loosely coiled apparently without any cyst. This condition contrasts with that found in the earthworm where a cyst is developed, but is probably due to the short time which elapsed between infection and examination, as the cyst is almost certainly produced by the host and not by the parasite. The vitality of the maggot did not appear to be impaired by the presence of the parasite, but infected adult flies tended to be somewhat sluggish and would normally be easy prey for birds in the natural state. Of 12 maggots and 12 flies so examined, all the maggots were infected, each with a single larva and 10 of the flies each again with a single larva. Feeding experiments to 12 chickens showed that most of the unexamined larvae and

imagines must also have been infected, for of 6 birds fed 20 maggots each, all developed 'gapes'—the number of pairs recovered post mortem being 1, 3, 4, 4, 4, and 8. Of the half-dozen birds fed on 20 flies each, 5 became infected, there being 2, 3, 5, 5, and 7 pairs, respectively, in the tracheae. The experiments described above are only preliminary and the beginning of a large scale group, but they prove definitely that some flies both in the larval and in the imaginal states may act as intermediate hosts for *S. trachea*. The *Syngamus* larva can apparently withstand the physical and physiological changes which accompany metamorphosis and still remain infective to chickens."

It is suggested that since many kinds of invertebrates must ingest the ova accidentally with their food, some may be ingested by wild birds with earthworms feeding mainly on pasture and woodland and become infected with a strain of gapeworm that can only complete its life cycle by means of an annelid. "Other birds in a more domestic environment which have easy access to dung, with its abundant insect fauna, will come to be definitive host to a strain of the same species needing an arthropod vector. It is quite likely that in the course of many generations the present species *S. trachea* will develop into a number of new varieties or even species each with their own individual vectors. A number of intermediate hosts which have been added accidentally to its economy may thus provide conditions favorable to the evolution of distinct species in different definitive hosts."

Empusa infections of the house-fly in relation to moisture conditions of northern Idaho, C. C. Yeager. (Univ. Idaho). (*Mycologia, 31 (1939), No. 2, pp. 154–156*).—It is concluded that the prevalence of *E. muscae* infections of the housefly vary directly with the amount of rainfall.

Housefly control, F. C. Bishopp (*U. S. Dept. Agr. Leaflet 182 (1939), pp. 6, figs. 5*).—A practical account.

Observations on the bionomics of the ox warble-fly (Hypoderma lineatum DeVillers), B. N. Soni (*Indian Jour. Vet. Sci. and Anim. Husb., 8 (1938), No. 4, pp. 375–380, figs. 3*).—Over 50 percent of the hill bulls purchased for experimental purposes were infested with warble grubs (*H. lineatum*). Nearly 51 days were required for the larvae to mature after their first appearance in the subcutaneous tissues of the animal's back.

Speed of Cephenemyia, C. H. T. Townsend (*Jour. N. Y. Ent. Soc., 47 (1939), No. 1, pp. 43–46*).—A discussion of the speed of male deer botflies of the tentatively determined species *C. pratti*.

Volatile oils as ovicides for the screwworm (Cochliomyia americana C. & P.), R. C. Bushland. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 430, 431*).—Tests were made of 37 volatile oils as ovicides for the screwworm, the eggs of this fly being divided into two classes according to age. "Oils of anise, bitter almond, cassia, fennel seed, mustard, parsley, pennyroyal, rue, sassafras, and sweet birch killed all eggs in the two classes. Oils of caraway seed, clove, and lemon grass, although they did not entirely prevent hatching of the older eggs, caused the larvae to die almost immediately after hatching. The younger eggs were more easily destroyed than the older eggs, for in addition to all the oils mentioned above, oils of bay, bergamot, cajuput, citronella, coriander, cumin seed, lavender, lemon, peppermint, pine needle, rosemary, savin, spearmint, sweet orange, verbena, and wormwood were completely effective against the younger eggs."

The Amazon fly Metagonistylum minense Towns. in British Guiana, L. D. Cleare (*Bul. Ent. Res., 30 (1939), No. 1, pp. 85–102, fig. 1*).—This report deals with the work undertaken in British Guiana, including the receipt from Brazil of the tachinid parasite *M. minense* (known as the Amazon fly), its rearing

from the initial shipments, and the subsequent rearing of large numbers for the colonization of the sugar estates of the colony, which extended over the period from September 1933 to April 1935. The work reported includes its bionomics, species of *Diatraea* attacked, colonization in British Guiana, cost of introduction, parasitism of *D. saccharalis* in rice and other host plants, status in 1937, and shipments of the parasite to the West Indies. A list of 19 references to the literature is included.

Note on Paratheresia introduction in Louisiana, C. H. T. Townsend (*Jour. N. Y. Ent. Soc., 47 (1939), No. 1, p. 38*).—Brief reference is made to the introduction of sugarcane borer parasites of the genus *Paratheresia* in Louisiana, not of the genus *Theresia* as previously reported (E. S. R., 80, p. 366).

Dexia rustica Fabr., a parasite of the cockchafer Melolontha vulgaris in Denmark [trans. title], P. Bovien and N. Bolwig (*Tidsskr. Planteavl, 43 (1939), No. 5, pp. 801–818, figs. 11; Eng. abs., pp. 816, 817*).—The parasitism of white grubs by *D. rustica* in Denmark was found to vary from 0 to about 50 percent. The grubs are attacked during the autumn of the year following hatching, with the highest parasitism occurring in the third and fourth years.

A review of the muscoid genus Eumacronychia, with key and descriptions of new species (Diptera), H. J. Reinhard. (Tex. Expt. Sta.). (*Jour. N. Y. Ent. Soc., 47 (1939), No. 1, pp. 57–68*).—Thirteen species of the tachinid genus *Eumacronychia* are recognized, of which 6 are described as new to science.

Sarcophaga aldrichi Parker as a parasite of Malacosoma disstria Hbn., A. C. Hodson. (Minn. Expt. Sta.). (*Jour. Econ. Ent, 32 (1939), No. 3, pp. 396–401, figs. 4*).—Field observations and cocoon examinations have demonstrated that the dipterous parasite *S. aldrichi* attacks the forest tent caterpillar at a time when the caterpillars are constructing their cocoons and pupating. "The life cycle of the parasite is adjusted in such a manner that the flies are ready to larviposit when the first cocoons appear in the field. They produce only one generation a year because of a long period of dormancy after leaving the host. They attack perfectly normal larvae and pupae in their cocoons and are not limited to parasitized or diseased hosts. *S. aldrichi* enters into direct competition with the other parasites and destroys them when they chance to occur in the same host. This species will breed in carrion, mashed caterpillars and other organic material. From the above evidence it may be classed as a facultative parasite which is bridging the ground between a specialized parasite and an exclusive scavenger."

Poison bait checks cherry fruit fly, S. C. Jones. (Oreg. State Col.) (*Better Fruit, 33 (1939), No. 10, p. 6*).—A poisoned bait spray consisting of 0.[illegible] lb. of lead arsenate, 2 qt. of molasses, and water to make 10 gal. has been found effective in combating the white-banded cherry fruitfly in Oregon. "Since the fly spends approximately 10 days feeding on liquid substances on the foliage before laying eggs, the first spray is recommended as soon as the flies begin to emerge to kill early emerging flies before they lay their eggs. . . Three sprays are usually sufficient to control the fly if no rains occur. The spray should be applied at weekly intervals dating from the time the first spray was applied. Rains will dissipate the spray, and the application should be repeated."

Two new species of Agromyza from South America (Dipt.: Agromyzidae), S. W. Frost. (Pa. State Col.). (*Ent. News, 50 (1939), No. 4, pp. 97–100*).—*A. braziliensis* from São Paulo, Brazil, and *A. ecuadorensis* from Baños, Ecuador, are described as new.

The reaction of the orange fruit to the autumn attack of the Mediterranean fruit fly and its economic status, E. RIVNAY, M. NADEL, and F. LITTAUER (*Hadar, 11 (1938), No. 11, pp. 317, 318, 321–323, fig. 1*).—A report contributed from the agricultural research station at Rehovoth.

Hippoboscid flies from North American doves, J. BEQUAERT (*Science, 89 (1939), No. 2308, pp. 267, 268*).—It is concluded that *Microlynchia pusilla*, which has been found by H. de Beaurepaire-Aragão[5] to transmit *Haemoproteus columbae* from pigeon to pigeon in Brazil, is the most likely natural vector of dove *Haemoproteus*.

Survival of the tropical rat flea in United States, R. L. ROUDABUSH (*Science, 89 (1939), No. 2300, pp. 79, 80*).—A discussion of the occurrence and probable survival of the oriental rat flea in several of the northern States.

Growth and survival of Japanese beetle larvae reared in different media, D. LUDWIG and H. FOX (*Ann. Ent. Soc. Amer., 31 (1938), No. 4, pp. 445–456, fig. 1*).—In attempts to rear Japanese beetle larvae in a variety of media, comprising molds derived from *Andropogon*, *Carex*, and *Osmunda*, dead *Sphagnum*, and such terrigenous products as soil and peat, only the mold derived from *Andropogon* furnished sufficient food for complete development and metamorphosis.

Preliminary notes on a method for the prevention and control of white grub infestations in nursery soils, H. L. MITCHELL (*Black Rock Forest Papers, 1 (1939), No. 14, pp. 95–97*).—An apparently satisfactory preventive measure which also proved effective in the control of existing May beetle (*Phyllophaga* sp.) infestations in nursery soils is described. It was found that treatment of white pine nursery beds immediately after planting with a solution consisting of 0.8 percent acetic acid at the rate of 0.75 qt. per square foot of seedbed to control damping-off is effective against white grubs. In every case one or at most two applications of the acetic acid rid the soil of grubs as well as earthworms and other insect life.

Notes on Pennsylvania flea beetles in tobacco fields (Coleoptera: Chrysomelidae), H. C. HALLOCK. (Pa. Expt. Sta.). (*Ent. News, 50 (1939), Nos. 5, pp. 121–124; 6, pp. 156–159*).—These notes relate to 11 species of flea beetles found in Pennsylvania upon tobacco or upon other plants growing either in the tobacco fields or in adjoining fields. "The most abundant species during April, May, and June was *Epitrix cucumeris*. This species caused severe injury to the foliage of tobacco plants that were growing in seedbeds and that had been recently transplanted. During the same period heavy feeding by *E. cucumeris* was also observed in potatoes and young tomato plants."

Investigations on wireworms and their control (*Univ. Manchester, Ent. Res. Sta., Warburton, Cheshire, Rpt., 1 (1937), pp. 31, figs. 8*).—Observations of wireworm attack on farm crops in Britain and on the soil, the biology and ecology of wireworms, and investigations on their control, contributed by H. W. Miles, M. Cohen, and R. Stewart, are reported.

Nutrition of certain wood-boring Coleoptera, H. E. SAVELY, JR. (*Jour. Elisha Mitchell Sci. Soc., 54 (1938), No. 2, pp. 195, 196*).—A brief report is made of observations in which 22 species of beetles were found to confine their feeding to the phloem of freshly cut pine logs.

On the biology of the Cerambycidae (Coleopt.), C. F. C. BEESON and B. M. BHATIA (*Indian Forest Rec., n. ser., Ent., 5 (1939), No. 1, pp. IV+235, pls. 8, figs. 17*).—This contribution includes a catalog of trees, shrubs, and woody climbers serving as host plants of Indian Cerambycidae (pp. 202–226).

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[5] Brazil Med., 30 (1916), Nos. 45, pp. 353, 354; 46, pp. 361, 362.

Notes on elm twig crotch injuries produced by Scolytus multistriatus Marsham, D. O. Wolfenbarger and W. D. Buchanan. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 377–381, figs. 9*).—These notes are based upon data and observations made over the 5-yr. period 1933–37, in the course of which the crotches of thousands of twigs from several hundred elm trees were examined for injuries.

The preservation of timber against the attacks of the powder post borer Lyctus brunneus Stephens by impregnation with boric acid, J. E. Cummins (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *12 (1939), No. 1, pp. 30–49, figs. 3*).—The results of laboratory tests have shown that boric acid, borax, or mixtures of boric acid and borax in low concentrations in wood prevented infestation by this borer.

New method of using paradichlorobenzene for seed treatment to control sweetpotato weevil, H. L. Dozier (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 372, 373*).—Experiments reported have demonstrated that paradichlorobenzene gas is very slow to penetrate the sweetpotato and requires a long time to kill the weevil under the most favorable conditions. It was shown that a 100-percent kill can be obtained in 13 days, with the possibility that this period can be slightly reduced by a few days.

Life history notes on the cowpea curculio (Chalcodermus aeneus Boh.), J. M. Langston. (Miss. Expt. Sta.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 374–377, fig. 1*).—From observations on the biology of this weevil, two generations were reared in each of the years 1935 and 1937 and three in 1936. Most of the adults that emerged on or before September 20 commenced laying eggs the same year, and probably continued the following year. "There are four larval instars, three and part of the fourth being passed in the seed and the remainder of the fourth in the soil. Under favorable conditions adults will emerge in about 20 to 30 days after egg deposition. With the exception of the last generation, which delays oviposition until the following spring, adults begin laying eggs about 10 days after emergence."

Races of bees for Iowa, O. W. Park. (Iowa Expt. Sta.). (*Philippine Jour. Anim. Indus., 5 (1938), No. 6, pp. 611–622*).

Methods of destroying red harvester ant nests, R. G. Dahms and F. A. Fenton. (Okla. A. and M. Col.). (*Pests, 7 (1939), No. 4, pp. 12–14*).

Chalcid flies attacking noxious beetles in India and New Guinea, C. Ferrière (*Bul. Ent. Res., 30 (1939), No. 1, pp. 163–168, figs. 3*).—Notes are presented largely on eight species of chalcid parasites of the cotton stem weevil *Pempheres affinis* Fst. in South India, of which four are described as new.

The effect of host size upon the sex ratio of hymenopterous parasites and its relation to methods of rearing and colonization, C. P. Clausen. (U. S. D. A.). (*Jour. N. Y. Ent. Soc., 47 (1939), No. 1, pp. 1–9*).—A discussion of some of the factors responsible for the fluctuations in the sex ratio of a species, particularly of the parasitic Hymenoptera, and their bearing upon biological control work.

A parasite of the Puerto Rican mole-cricket, G. N. Wolcott. (P. R. Col. Expt. Sta.). (*Science, 89 (1939), No. 2318, pp. 508, 509*).—The successful establishment in Puerto Rico of *Larra americana*, a specific wasplike parasite of the changa or Puerto Rican mole cricket *Scapteriscus vicinus* Scudd., following its introduction from Brazil, is reported.

Ecological notes on the Sirex wood wasps and their parasites, H. S. Hanson (*Bul. Ent. Res., 30 (1939), No. 1, pp. 27–65, pls. 6*).—Report is made of a study commenced in 1927. A brief outline of the life cycle of *Sirex* and the parasites is given. The difference in the method of attack by the parasites on

the host is described, and some points of interest in connection with insect behavior are discussed.

The **outbreak of the European spruce sawfly in Canada and some important features of its bionomics,** R. E. BALCH (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 412–418*).—Information is given on the life history, number of generations, diapause, reproduction, flight, feeding habits, evidence of European origin, comparison of Canadian and European forms, present distribution, degree of infestation, damage, and future development of outbreak of the European spruce sawfly in Canada.

Effective control of culture mites by mechanical exclusion, H. N. HANSEN and W. C. SNYDER. (Univ. Calif.). (*Science, 89 (1939), No. 2311, p. 350*).—A description is given of a method of controlling mycophagous mites that invade test tubes and destroy pure cultures or contaminate them with other fungi or bacteria. The method, which is based on the positive exclusion of the mites from test-tube cultures by mechanical means, has the advantage over older methods of being effective, nontoxic to fungi, inexpensive, and easily applied.

The seasonal and annual incidence of the sheep tick Ixodes ricinus in Britain, J. MACLEOD (*Bul. Ent. Res., 30 (1939), No. 1, pp. 103–118, figs. 12*).—A report of the work conducted during the years 1930–38 in one or more of the principal tick-infested areas of Scotland and England.

The genera Dermacentor and Otocentor (Ixodidae) in the United States, with studies in variation, R. A. COOLEY (*U. S. Pub. Health Serv., Natl. Inst. Health Bul. 171 (1938), pp. V+89, pls. 31, figs. 8*).—The author recognizes and gives detailed descriptions and illustrations of seven species of ticks of the genus *Dermacentor*, namely, the American dog tick (*D. variabilis*), *D. andersoni* Stiles, the Pacific coast tick (*D. occidentalis*), *D. hunteri* Bishopp, *D. parumapertus* Neum., *D. halli* McIntosh, and the winter tick (*D. albipictus*), and one of the new genus *Otocentor*, namely, *O.* (*Dermacentor*) *nitens* (Neum.).

Amblyomma philipi, a new tick from Texas and Mexico, with a key to known species of Amblyomma in the United States (Acarina: Ixodidae), R. A. COOLEY and G. M. KOHLS (*Pub. Health Rpts. [U. S.], 54 (1939), No. 2, pp. 44–47, pls. 2*).—Under the name *A. philipi* description is given of a new species of tick collected from the cottontail, jack rabbit, and coyote in Texas.

Variation in Moniezia expansa Rudolph, S. R. WILLIAMS (*Ohio Jour. Sci., 39 (1939), No. 1, pp. 37–42, figs. 2*).—A report of a morphological study of this important cestode parasite of sheep and cattle.

An ecological study of Wyoming spruce-fir forest arthropods with special reference to stratification, E. FICHTER. (Univ. Nebr.). (*Ecol. Monog., 9 (1939), No. 2, pp. 183–215, figs. 8*).—An account is given of the region, habitat, and methods employed to study the animal population, and quantitative studies of arthropods occurring in a Wyoming spruce-fir forest, accompanied by a list of 36 references. A list of arthropods taken in the spruce-fir forest from June 29 to August 24, 1936, is given in an appendix.

ANIMAL PRODUCTION

[Experiments with livestock in Hawaii] (*Hawaii Sta. Rpt. 1938, pp. 62–64, 68–74, 83, 84*).—Studies for which results are reported include the relative palatability of nine species of native grasses, by R. A. Lyman and J. C. Ripperton; the value of cane molasses, soybean oil meal, and fish meal as supplements to pasture for beef cattle, by L. A. Henke, S. H. Work, and A. W. Burt; the use of relatively cheap local feeds in steer fattening rations, the value of pineapple bran for fattening pigs, and the value of roasted soybeans as a protein supplement in swine rations, all by Henke and Work; and the digestibility

of local feeding stuffs, and the utilization of urea nitrogen by swine, both by Work. From tests with poultry results are noted on the use of cane molasses and algarroba bean meal in laying rations, the results of using a laying ration composed entirely of local feeding stuffs, breeding for high egg production and resistance to disease, and temperature conditions in all-steel or semisteel poultry houses, all by C. M. Bice.

[**Livestock investigations in Idaho**] (*Idaho Sta. Bul. 229 (1939), pp. 6–10, 12–14, 26, 27, 34, 35, 37–39*).—Included are brief progress reports on the seasonal changes in the calcium and phosphorus content of range plants, the phosphorus requirements of steer calves and of growing and fattening lambs, the efficiency of farm-grown feeds in supplying phosphorus for lambs, the returns secured from fattening cut-back yearling steers on pasture, the relative economy of adding protein concentrates to the rations of calves and of yearling steers, a comparison of various protein concentrates in lamb rations, the value of cull potatoes in wintering rations for ewe lambs, and the tonnage of chopped alfalfa hay. From poultry experiments results were noted on the carotene requirements of laying hens, the carotene content of commercial dehydrated alfalfa, the influence of various levels of carotene intake on the carotene content of egg yolks, the relative effectiveness for hens of vitamin A in natural cod-liver oil and in cod-liver oil concentrate, the value of soybean oil meal in turkey growing rations, and the possibility of decreasing mortality of poultry through selective breeding.

[**Livestock investigations in Indiana**] (*Indiana Sta. Rpt. 1938, pp. 33–37, 80–83, 90, figs. 2*).—Studies for which results are briefly reported include the value of grinding ear corn for steers, mixed-protein v. single-protein concentrates for steers, and rations for raising winter calves, all by F. G. King; the use of supplements of nonleguminous roughages for breeding ewes, and the value of cutting hay for fattening lambs, both by C. Harper; the shrinkage, fill, and yield of hogs trucked to market, and factors affecting the carcass grade of hogs, both by J. R. Wiley; supplemental protein mixtures for growing and fattening hogs, and processed soybeans in brood sow and pig rations, both by C. M. Vestal; the effect of soybeans and soybean products on the quality of pork, the nutritive value and mineral deficiencies of soybeans and soybean products, the effect of hominy feed on the quality of pork, and various factors involved in the production of quality pork, all by C. L. Shrewsbury and Vestal; and the carotenoid pigments contained in farm crops and feeding stuffs, with special reference to their nutritive properties, by H. R. Kraybill, Shrewsbury, and F. P. Zscheile.

Reports of poultry investigations include the reduction of protein in rations for chicks, returns from fine, medium, and coarse ground corn in chick rations, wheat as a substitute for corn in poultry rations, the use of soybean oil meal in broiler rations, by R. E. Roberts and C. W. Carrick; the response of Leghorn pullets to artificial lighting, and wheat v. corn with scratch grains for layers, both by Carrick; the effects of varying ventilation, heat, and humidity conditions in poultry houses, by Carrick and I. D. Mayer; breeding for a specific body size in turkeys, and genetic influence on rate of growth in chickens, both by E. E. Schnetzler; and various phases of poultry management at the Moses Fell Annex Farm.

[**Livestock experiments in Louisiana**] (*Louisiana Sta., Rice Sta. Bien. Rpt. 1937–38, pp. 28–32*).—Results are briefly reported on the response of permanent pastures in southwestern Louisiana to fertilizer, by R. H. Lush and J. L. Fletcher; and the value of rice byproducts and molasses for fattening beef cattle and lambs, and rations for wintering beef cattle in the rice area, both by M. G. Snell.

[**Livestock investigations in Nebraska**] (*Nebraska Sta. Rpt.* [*1938*], *pp. 36, 37, 39, 40, 48, 49, 51, 52*).—Results are briefly reported for the following studies: Sorghum grains v. corn for fattening steers; a comparison of alfalfa hay, prairie hay, and silage in steer fattening rations; the effect of bonemeal and cottonseed cake as supplements to prairie hay on the blood calcium and phosphorus levels of breeding cattle; silage plus mineral supplements v. alfalfa hay and grain for wintering calves; the relative value of cottonseed cake, soybean oil meal, and tankage as supplements to sand hill meadow hay for wintering range calves; the value of sorghum grains and a comparison of whole alfalfa hay v. cut alfalfa hay for fattening lambs; corn v. sorghum grain when self-fed to pigs in dry lot; the need of protein supplement when grain sorghums are fed to pigs; returns from hogging off grain sorghum; and the value of Sudan grass pasture for pigs.

Reports of poultry investigations include the manganese requirements of growing poults, the value of complex mineral mixtures in a poultry ration, the optimum amount of salt for chicks, the value of grain sorghums for poultry, certain factors affecting the carotene content of poultry feeding stuffs, the effect of applying heat to poultry rations, and genetic differences existing in turkey flocks.

Studies on growth and early maturity, G. H. HART. (Univ. Calif.). (*Vet. Med.*, *34* (*1939*), *No. 4*, *pp. 212–216*).—A review.

Retarded growth, life span, ultimate body size, and age changes in the albino rat after feeding diets restricted in calories, C. M. MCCAY, L. A. MAYNARD, G. SPERLING, and L. L. BARNES. (Cornell Univ.). (*Jour. Nutr.*, *18* (*1939*), *No. 1*, *pp. 1–13*, *figs. 4*).—In an attempt to verify earlier findings (E. S. R., 74, p. 241), rats were retarded in growth for periods of 300, 500, 700, and 1,000 days by providing rations complete except for calories before being allowed to grow to maturity. Those retarded for even 300 days never became as large as those which matured normally. After 1,000 days of retardation, only part of the rats were able to resume growth when adequate energy was provided. However, even at this extreme, males grew to larger size than females. The maintenance of constant body weight did not check the growth of bones. These increased slowly in length and responded to realimentation in all cases after 700 days' retardation, but in only part of the cases after 1,000 days.

Chemical and pathological changes in aging and after retarded growth, C. M. MCCAY, G. H. ELLIS, L. L. BARNES, C. A. H. SMITH, and G. SPERLING. (Cornell Univ.). (*Jour. Nutr.*, *18* (*1939*), *No. 1*, *pp. 15–25*, *figs. 4*).—Certain chemical and pathological changes accompanying aging were studied in the above-described rats. The calcium content of the eye tended to increase in proportion to the time a rat had lived without regard to the degree of retardation of growth, with a rapid deposit of calcium in the eye after animals were 900 days of age. Eye calcium was not correlated with either changes in the bones or with calcification of other tissues. A few animals had intact teeth at very advanced ages, females showing more damage to the teeth than males even though the females had never reproduced. Calcification of the coastal cartilages was much more marked in normal rats than in those of like age that had been retarded in growth. There was a higher incidence of calcification of the aortas in the retarded animals. Limited evidence indicated that retarded animals were less susceptible to lung diseases at 1 yr. of age than normals, also that there was lower incidence of tumors in the retarded ones.

Experiments with the filtrate factor, T. H. JUKES. (Univ. Calif.). (*Jour. Biol. Chem.*, *128* (*1939*), *No. 1*, *pp. 35–43*, *fig. 1*).—Employing essentially the same methods of assay as previously described (E. S. R., 78, p. 231), further

studies were made to determine certain properties of the filtrate factor. It was found to be destroyed in alkaline solution at 100° C. and by the action of potassium permanganate in acid solution. It was not destroyed in alkaline solution at room temperature or by the action of bromine in acid or alkaline solution. Attempts to form insoluble compounds of the factor with silver, mercury, copper, or cadmium were unsuccessful. Autoclaving yeast or rice bran extract at 120° for 5 hr. had a destructive action on the factor. Other reactions of the factor indicated it to be a comparatively strong organic acid which is dissociated almost completely at pH 6.0.

Growth-stimulating action of ferric chloride-treated wheat germ oil, H. M. EVANS and G. A. EMERSON. (Univ. Calif. et al.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 170–172*).—Wheat germ oil treated with ferric chloride so that it contained about one-tenth of the vitamin E activity of the original oil was nearly as effective as the untreated oil in stimulating growth in female rats which had plateaued in weight on the vitamin E-low diet. These findings suggest that the growth-stimulating effect of wheat germ oil is attributable to some constituent other than vitamin E.

Use of liver extract in place of yeast in low fat diets, J. M. MCKIBBIN, J. J. OLESON, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 25–29*).—In the course of a study of deficiencies resulting from low fat diets for rats, it was found that the use of liver extract as a source of the vitamin B complex instead of ether-extracted yeast resulted in earlier and more acute deficiency and hence in a greater growth response when fat was added to the diet.

Radioactive phosphorus as an indicator of phospholipid metabolism.—V, On the mechanism of the action of choline upon the liver of the fat-fed rat, I. PERLMAN and I. L. CHAIKOFF. (Univ. Calif.). (*Jour. Biol. Chem., 127 (1939), No. 1, pp. 211–220, figs. 2*).—Continuing these studies (E. S. R., 81, p. 88), the rate of phospholipid turn-over was compared in the livers of rats receiving choline (by stomach tube) and untreated rats on the same basal diet with the aid of a radioactive isotope of phosphorus. The administration of choline increased the rate of phospholipid metabolism in the liver, the increase being proportional to the amount ingested within the range tested (0 to 30 mg. of choline chloride per rat). The increased phospholipid metabolism appeared approximately 1 hr. after administration of choline, and its effect disappeared in about 10 to 12 hr. thereafter.

Composition of common California foothill plants as a factor in range management, A. GORDON and A. W. SAMPSON. (Coop. U. S. D. A.). (*California Sta. Bul. 627 (1939), pp. 95, figs. 25*).—This report of an extensive study on the San Joaquin Experimental Range of the U. S. D. A. Forest Service deals with the chemical composition of the chief grass species, the grasslike species, and the broadleaved herbs, shrubs, and arborescents; certain phylogenetic relations; the influence of habitat and season on composition; and the general application of the findings to range management

Most of the species of grasses, grasslike plants, and broadleaved herbs showed a continuous and rather orderly decline in crude protein, silica-free ash, calcium, phosphorus, and potassium from early growth to plant maturity, while crude fiber increased with advance of season. The levels of protein in these three groups at corresponding growth stages were similar, and the variation in chemical values in the entire life cycle of plants of a given species was greater than between the various species at any single stage of growth. The deciduous shrubs and trees showed the highest average protein level of all the groups, with a gradual downward trend with advance of season.

The deciduous half-shrubs and nondeciduous shrubs had the lowest protein level of the several groups, but showed relatively little change with advance of season. The calcium : phosphorus ratio showed characteristic behavior in the respective plant groups. In grasses the ratio remained at approximately 1 : 1 at all growth stages, while in the other groups there was a marked widening of the ratio with approach of maturity, especially in the deciduous shrubs and trees. A marked consistency in the composition of all constituents within a species through the growth cycle from year to year was evident. The application of these findings in appraising the value of ranges and in range management is fully discussed.

Results of pasture fertilization at Lafayette, Louisiana, R. H. LUSH and J. L. FLETCHER (*Louisiana Sta. Bul. 304 (1939), pp. [1]+21, fig. 1*).—Pasture fertilization experiments were conducted on the rolling prairie soils of southwestern Louisiana over a 10-yr. period, the returns being measured in hay yields and/or by grazing with dairy cattle. Heavy applications of lime without other treatment slightly increased hay yields but decreased grazing returns as compared with untreated areas. Over a 5-yr. period yields were increased 31.4 percent by an annual application of 200 lb. each of nitrate of soda and superphosphate, 26.3 percent by 200 lb. of nitrate of soda, and 26.8 percent by 100 lb. each of muriate of potash, superphosphate, and nitrate of soda, all as compared with yields from untreated areas. An application of 140 lb. of ammonium sulfate decreased the yield 35.6 percent by inhibiting the growth of clovers. Annual applications of 150 lb. of Cyanamid plus two applications of 150 lb. of Ammophoska during the period increased hay yields an average of 66.7 percent. In 1 yr. a 500-lb. application of basic slag gave a 71.7 percent increase in yield. Hay yields on old pasture were more than doubled by a 200-lb. application of nitrate of soda and more than trebled by application of 200 lb. each of nitrate of soda and superphosphate.

In grazing trials with milking cows the feed replacement value from pastures on the basis of prevailing feed prices was $41.52, $45.16, $55.53, and $58.54 per acre from the untreated pasture and from those receiving complete fertilizer and lime, Cyanamid, and nitrate of soda plus superphosphate, respectively. The composition of the grass as affected by advance of season and by the various fertilizer treatments is indicated. Under the conditions of this experiment a judicious fertilization of pastures is concluded to be a sound and economical practice.

[**Pasture fertilization tests in eastern Louisiana**] (*Louisiana Sta., Fruit and Truck Sta. Bien. Rpt. 1937–38, p. 22*).—Results are briefly noted.

Commercial feeding stuffs—reports on inspection, 1938, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 425 (1939), pp. 99*).—This is the usual report of the guaranteed and found analyses of 888 samples of feeding stuffs collected for official inspection during the calendar year 1938 (E. S. R., 80, p. 84); assays of 55 vitamin D carriers, by R. B. Hubbell and Bailey; and 86 samples examined for poisons, by C. E. Shepard.

Commercial feeding stuffs, L. S. WALKER, E. F. BOYCE, and L. E. DAVIS (*Vermont Sta. Bul. 447 (1939), pp. 48*).—This is the usual report of the analyses for protein, fat, and fiber of 2,046 samples of feeding stuffs collected for official inspection during December 1938 (E. S. R., 81, p. 89).

Cattle fodder and human nutrition, with special reference to biological nitrogen fixation, A. I. VIRTANEN (*Cambridge, Eng.: Univ. Press, 1938, pp. [7]+108, pls. [8], figs. [17]*).—This book comprises four lectures delivered at the Universities of London and Reading in November 1937. The lectures dealt with the mechanism of the biological N-fixation; the symbiosis of the leguminous

plants with the legume bacteria; the production of vitamins in agriculture, with special reference to human nutrition; and the A. I. V. method for the preservation of fresh fodder and its importance in agriculture.

Some effects of the species and stage of maturity of plants on the forage consumption of grazing steers of various weights, W. P. GARRIGUS and H. P. RUSK (*Illinois Sta. Bul. 454 (1939), pp. 441–508, figs. 8*).—In the trials reported, the amount of forage consumed by grazing steers was estimated by collection of the feces (collection bags and harness described), determining the dry matter content of the feces, and estimating the forage consumption on the basis of a predetermined ratio between dry matter ingested and dry matter defecated. The relative accuracy of this method with other previously used methods is discussed. A total of 27 grazing trials were conducted on six types of forage with steers ranging from 400 to 1,000 lb. in weight. Expressing the amount of forage consumed in terms of percentage of the net energy maintenance requirement of the steers, the amount consumed by steers on Kentucky bluegrass approximately 5 weeks old was 227–313 percent, on red clover in the ¼-bloom stage 215–259, on red clover on which three-fourths of the blooms had turned brown 199–249, on young second-growth reed canary grass 142–222, on bromegrass in the late-fall-growth stage 116–162, and on alfalfa in the ¾- to full-bloom stage 124–134 percent. The statistical significance of these differences is indicated. The species of forage exerted a greater influence than the size of steers on the rate of forage consumption when expressed as a percentage of net energy maintenance requirements.

Wool growth and quality as affected by certain nutritional and climatic factors.—III, Results and conclusions, J. E. BOWSTEAD and P. LAROSE (*Canad. Jour. Res., 16 (1938), No. 12, Sect. D, pp. 361–374*).—Continuing these reports (E. S. R., 80, p. 284), a summary of the results indicates that variations in the environmental temperature and humidity had little influence on wool growth and quality. Early-sheared fleeces were slightly coarser and stronger than late-sheared ones. Feeding a submaintenance ration to pregnant ewes during the winter seriously reduced the amount and quality of wool produced. Ewes maintained in fair condition produced fleeces regarded as normal, while heavy feeding slightly increased fleece weight over the normally fed lot. Other variations in dietary regime studied had little influence on wool development.

The relative importance of sow and litter during the growth of suckling pigs: A comparison of fostered with normally reared pigs, H. P. DONALD (*Empire Jour. Expt. Agr., 7 (1939), No. 25, pp. 32–42*).—In experiments at the University of Edinburgh, paired litters of pigs farrowed at approximately the same time were each divided into two groups, one of which was left with its own mother and the other transferred to the second sow in exchange for a comparable group. Results from 20 litters reared in this way showed an equal and significant variation in growth of pigs up to 3 weeks between litters as born and litters as raised. The weight of pigs at 8 weeks of age was influenced considerably by the sow, but when adjusted for variation in weight at 3 weeks the effect of the litters as born was no longer significant, leading to the conclusion that under these conditions the milk production of the sows is the most important factor in the growth of suckling pigs. The applicability of this method to other investigations concerning suckling pigs is discussed.

[Studies on animal proteins for swine, I, II] (*Meld. Norges Landbr. Høiskole, 18 (1938), No. 6, pp. 393–459, fig. 1; Eng. abs., pp. 438–444, 457–459*).—These studies were conducted at the Institute of Animal Nutrition of the Royal Agricultural College of Norway.

I. *The influence of herring meal and other feeds of animal origin on the quality of pork*, M. Husby (pp. 394–444).—The effects of herring meals of high and low salt content, herring cake, herring oil, a herring-molasses mixture, whale meal, dogfish meal, and tankage on the firmness, color, taste, and odor of pork are reported. The tankage at all levels tested resulted in an excellent quality of pork, while the fish products had to be carefully limited in level of intake to avoid quality defects. Safe levels for the various fish products are indicated. The fat content of the various fish products appeared to be of vital importance in affecting the firmness, color, and taste of the pork.

II. *Content of acids in pig fat*, K. Haug (pp. 444–459).—A comparison of the composition of fat from pigs on high and low levels of herring meal showed that a high level of feeding resulted in a marked increase in the amount of the highly unsaturated acid $C_{20}H_{30}O_2$. The close quantitative relation between herring taste and the content of highly unsaturated C_{20} acids suggests that these acids may be the cause of the herring flavor.

Brewers' grains (fresh) as a pig food: Results of experiments at Wye, V. C. Fishwick (*Jour. Inst. Brewing, 45 (1939), No. 3, pp. 119, 120*).—In trials comparing the rate and efficiency of gain of groups of pigs (initial weight about 85 lb.) receiving a standard ration for bacon pigs with a comparable group receiving 2 parts of the above ration plus 1 part of fresh brewers' grain, the former group made average gains of 88.8 lb. per pig and consumed 4.03 lb. of meal per pound of live weight gain, while the latter group averaged 82.4 lb. of gain per pig and consumed 3.72 lb. of meal plus 1.83 lb. of brewers' grain per pound of gain. None of the carcasses from the lots receiving the brewers' grain were graded as soft, indicating that, when properly balanced, brewers' grain had no detrimental effect on the quality of the fat.

Nicotinic acid in swine nutrition, L. C. Madison, R. C. Miller, and T. B. Keith. (Pa. State Col.). (*Science, 89 (1939), No. 2317, pp. 490, 491*).—A case is cited of a herd of pigs, weighing from 20 to 45 lb. each, which had become generally unthrifty and was affected with diarrhea and a dermatitis on the body and ears while receiving a ration of corn, oats, wheat middlings, and tankage with some skim milk and access to good grass pasture. Administration of nicotinic acid at the rate of 50 mg. daily per head for 2 weeks caused a marked and rapid improvement in these pigs. Ground alfalfa and cod-liver oil were then included in the ration and within 6 weeks the entire herd had completely recovered and normal growth had been resumed.

Individual and breed variations in pigs on rations devoid of vitamin D, D. W. Johnson and L. S. Palmer. (Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 58 (1939), No. 12, pp. 929–939*).—Trials were conducted during three successive winters to determine the vitamin D requirements of growing pigs, representatives of the Chester White, Duroc-Jersey, Hampshire, and Poland China breeds being used during the course of these trials. The basal ration fed throughout contained 0.64 percent of phosphorus and had a calcium : phosphorus ratio of about 1.65 : 1. All trials started in late December or early January, with the pigs confined in heated houses in the complete absence of sunshine. The results gave conclusive evidence that pigs require added vitamin D after their body stores of this vitamin have been depleted. All colored pigs (except two Duroc-Jerseys) which had access to the outside prior to starting on test had vitamin D stores sufficient to protect them from rickets for only from 4 to 8 weeks. White pigs of the Chester White breed and one nearly white Hampshire pig raised under the same conditions prior to the test were protected for approximately twice as long. Following vitamin D depletion, the blood calcium of the pigs fell from a normal of from 10 to 12

mg. per 100 cc. of blood plasma to below 6 mg. When low blood-calcium values were reached tetany occurred, and the reduction was accompanied by a gradual loss of appetite, rough coat, emaciation, and usually lameness.

The Alabama standard for canned dog food, C. J. KOEHN and W. D. SALMON. (Ala. Polytech. Inst.). (*Vet. Med., 34 (1939), No. 5, pp. 314–318*).—*Based on the results of analyses and tests to determine the nutritive value of* canned dog foods (E. S. R., 81, p. 408), a standard for canned dog food as described in this article was officially adopted in July 1938.

Seasonal fox rations and quantities to feed, C. F. BASSETT. (U. S. D. A.). (*Amer. Fur Breeder, 12 (1939), No. 1, p. 20*).—Practical rations for adult males, adult vixens, and weaned pups for various seasons of the year are described.

Protein requirements of chickens at various stages of growth and development, A. E. TEPPER, R. C. DURGIN, and T. B. CHARLES (*New Hampshire Sta. Bul. 312 (1939), pp. 20*).—In two extensive tests to determine the optimum levels and sources of protein intake for chickens during the various stages of growth and production, 12 rations were compared. Protein levels of 15, 17, and 19 percent were used with fish meal, meat scrap, and dried skim milk, each separately and the three in combination, constituting the main source of protein. As the percentage of protein increased a definite increase in body weight of the chicks occurred. Those groups receiving the protein mixture or fish meal alone were definitely heavier at 12 weeks than those on comparable protein levels supplied by meat scrap or dried skim milk. During the growing period (12–23 weeks) the groups on the lower protein levels were most efficient in feed utilization. The groups receiving fish meal as the sole source of animal protein produced a greater number of eggs per bird, had the lowest feed cost per dozen eggs produced, and were earliest in sexual maturity as measured by average days to first egg. The percentage protein in the rations did not significantly influence age at sexual maturity nor size of egg laid. No significant relationship was observed between mortality and the source of animal protein fed. The maximum amount of protein which could be supplied by meat scrap or dried skim milk was definitely lower than in the case of fish meal. A ration containing 13 percent of fish meal (19 percent total protein) did not adversely affect the odor or flavor of either meat or eggs.

Factors affecting manganese utilization in the chicken, H. S. WILGUS, JR., and A. R. PATTON. (Colo. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 1, pp. 35–45*).—A more comprehensive report of research noted (E. S. R., 81, p. 410).

Studies on phosphorus metabolism in normal and rachitic chickens with a radioactive phosphorus isotope.—III, The distribution of the injected phosphorus in the organs, especially in the different parts of the leg bones, M. J. L. DOLS, B. C. P. JANSEN, G. J. SIZOO, and G. J. VAN DER MAAS (*K. Nederland. Akad. Wetensch., Proc., 42 (1939), No. 6, pp. 499–505, pl. 1*).—A more comprehensive report of research previously noted (E. S. R., 81, p. 560).

A study of blood and bone phosphatase in chick perosis, A. C. WIESE, B. C. JOHNSON, C. A. ELVEHJEM, E. B. HART, and J. G. HALPIN. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 127 (1939), No. 2, pp. 411–420, figs. 2*).—In a further report (E. S. R., 80, p. 674) a revised method for measuring the blood and bone phosphatase activity is described. It was found that the blood and bone phosphatase activity of chicks with perosis was definitely lower than that of nonperotic chicks. In a series of in vitro experiments to determine the effect of various ions on the activity of bone phosphatase it was found that manganese had an activating influence on the enzyme, while calcium and phosphorus ions depressed the activity. Magnesium, which caused some activation of the enzyme, failed to exert a curative effect against perosis in chicks.

The stability of carotene and vitamin A in a mixed ration, R. M. BETHKE, P. R. RECORD, and O. H. M. WILDER. (Ohio Expt. Sta.). (*Poultry Sci., 18 (1939), No. 3, pp. 179–187*).—The stability of vitamin A in cod-liver oil and carotene in dehydrated alfalfa leaf meal, each incorporated in a mixed ration and stored at approximately room temperature, was determined by chick bio-assays. When either the oil or the meal was incorporated in an ordinary-type ration containing meat scrap and dried skim milk, approximately 75 percent of the vitamin A or carotene was lost after 6 months' storage, although significant amounts of these added factors were still present. When casein replaced meat scrap and dried skim milk in the basal mixture, the rate of vitamin A or carotene loss during storage was markedly reduced, suggesting that the destruction of these factors is influenced by the fat or free fatty acid content of the ration. Addition of 0.1 percent of hydroquinone to the diluted cod-liver oil solution before incorporation in the meat scrap-dried skim milk ration did not decrease the loss of vitamin A during storage.

The vitamin B_2 complex and allied factors: Avian factors, J. R. O'BRIEN (*Cur. Sci. [India], 6 (1938), No. 10, pp. 490–493*).—A review, with 56 references to the literature.

The ascorbic acid content of blood plasma of laying hens, A. D. HOLMES, F. TRIPP, and G. H. SATTERFIELD. (Univ. N. C. et al.). (*Poultry Sci., 18 (1939), No. 3, pp. 192–200*).—Following a similar study with chicks (E. S. R., 80, p. 672), the ascorbic acid content of the blood plasma of laying hens was determined. Seven groups of birds were used, the assay on group 1 being made at the beginning of the trial (20 weeks of age); group 2 at 30 weeks of age (10 weeks' egg production); group 3 at 36 weeks (16 weeks' egg production); groups 4, 5, and 6 at 72 weeks (1-yr. egg production); and group 7 at 86 weeks (66 weeks' egg production). The average ascorbic acid content of the plasma was 1.836, 1.129, 1.628, 1.061, 1.288, 1.073, and 1.906 mg. percent for groups 1 to 7, respectively. Individual birds varied widely to give a considerable range within each group. These data reveal very little correlation between the ascorbic acid of the plasma and the egg production, body weight, feed intake, or age of the birds.

Nature and partial synthesis of the chick antidermatitis factor, D. W. WOOLLEY, H. A. WAISMAN, and C. A. ELVEHJEM. (Univ. Wis.). (*Jour. Amer. Chem. Soc., 61 (1939), No. 4, pp. 977, 978*).—Continuing this line of investigation (E. S. R., 80, p. 673), it was found that a preparation rich in the chick antidermatitis factor could be readily inactivated by treatment with alkali. β-alanine could be isolated from the alkali-inactivated concentrates, and the acidic part of the alkali-inactivated material could be reactivated by coupling with synthetic β-alanine in the manner described. It appeared from these experiments that the chick antidermatitis factor is a hydroxy acid in amide linkage with β-alanine and is very similar in properties to pantothenic acid.

Pantothenic acid and the filtrate factor (chick anti-dermatitis) factor, T. H. JUKES. (Univ. Calif.). (*Jour. Amer. Chem. Soc., 61 (1939), No. 4, pp. 975, 976*).—Preliminary chick feeding trials in which a heated (filtrate factor deficient) basal diet was supplemented with varying levels of a calcium pantothenate preparation gave evidence that this preparation was markedly active in protecting against chick dermatitis at the 10-mg. level. Comparison with the positive control diet indicated that this preparation had a minimal activity of approximately 8,400 filtrate factor units (E. S. R., 78, p. 231) per gram. A ratio of approximately 5:1 exists between Williams yeast pantothenic acid unit and the chick filtrate factor unit.

Nutritional gizzard lesions in chicks, W. B. Esselen, Jr. (Mass. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 3, pp. 201–209, fig. 1*).—A comparison of eight different diets with reference to their effect on the gizzard linings of young chicks showed that the unsupplemented basal diet of Almquist and Stokstad (E. S. R., 77, p. 676) was most effective in producing nutritional gizzard lesions, the lesions being produced within 2 weeks when starting with day-old chicks. The Massachusetts State College chick ration (control) gave practically complete protection against this disorder. The addition of a mixture of 15 percent each of wheat bran, wheat middlings, and oat groats, and 4 percent of alfalfa leaf meal to the Almquist diet gave good protection against the lesions. There appeared to be little correlation between the rate of growth and the severity of the gizzard lesions. In curative trials, dried pork lung, alfalfa leaf meal, soybean meal, oat groats, and wheat middlings were all effective to some degree. Chicks fed an adequate diet for 1 or 2 weeks soon developed gizzard lesions when placed on the deficient basal diet, indicating that very little of the protective factor is stored by the chick. Turkey poults appeared either unsusceptible to this disorder or much more resistant to it than chicks.

Nutritional encephalomalacia in chicks and certain related disorders of domestic birds ([*Connecticut*] *Storrs Sta. Bul. 229 (1939), pp. 121, pls. 20, figs. 8*).—This monograph is a comprehensive presentation of accumulated facts which appear to establish nutritional encephalomalacia of chicks as a definite entity in the group of deficiency diseases.

The several chapters discuss the Clinical Picture, by A. M. Pappenheimer and M. Goettsch (pp. 9–14); Pathology, by A. M. Pappenheimer, A. Wolf, and M. Goettsch (pp. 15–24); Brain Weight and Moisture Content, by M. Goettsch and A. M. Pappenheimer (pp. 25–30); Blood Volume, by A. M. Pappenheimer and S. Graff (pp. 31–37); Non-infectious Character of the Disease, by A. M. Pappenheimer (pp. 39–42); Comparison of Natural Foods Diets and Diet 108, by M. Goettsch (pp. 43–48); Protective Experiments With Natural Food Stuffs, by M. Goettsch and A. M. Pappenheimer (pp. 49–58); Preventive Effect of Vegetable Oils and Their Fractions, by M. Goettsch, H. B. Gillespie, and A. M. Pappenheimer (pp. 59–67); The Occurrence of Encephalomalacia in the Field, by E. Jungherr and K. C. Seeger (pp. 69–79); Nutritional Myopathy in Ducklings, by A. M. Pappenheimer and M. Goettsch (pp. 81–88); Nutritional Myopathy of the Gizzard in Turkeys, by E. Jungherr, K. C. Seeger, and A. M. Pappenheimer (pp. 89–96); and Various Forms of Leg Weakness in Chicks: Differential Diagnosis, by E. Jungherr and A. M. Pappenheimer (pp. 97–112).

The general discussion stresses the fact that chicks, ducks, and turkeys develop entirely different pathological symptoms when fed the same deficient diet, the lesions being confined to the brain in chicks, to the skeletal muscles in ducks, and to the smooth muscle of the gizzard in turkeys. Complete protection against chick encephalomalacia is obtained by administering a vitamin E concentrate or α-tocopherol, thus indicating that only one factor is concerned in this disease. A bibliography of 130 references is appended.

Failure of "vitamin K" excess to heal encephalomalacia of chicks, H. C. Mason. (Univ. Ill.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 50, 51*).—Experiments at the University of Illinois, in which healthy chicks were fed the Pappenheimer and Goettsch deficiency ration No. 108, gave evidence that nutritional encephalomalacia in chicks is not prevented by the administration of an excess of vitamin K.

Dry skimmilk in rations for growing, laying, and breeding fowls, W. H. Ott, H. C. Knandel, and R. V. Boucher (*Pennsylvania Sta. Bul. 381 (1939),*

pp. 30, figs. 6).—In three series of experiments eight all-mash rations varying in content of dried skim milk from 0 to 8.75 percent, by 1.25 percent increments, were fed to groups of White Leghorn chickens from 1 day to 72 weeks of age. All groups received 16.9 percent protein starting rations to 12 weeks and 14.4 percent protein rations thereafter. The rate of growth during the first 2 weeks was directly related to the level of dried skim milk in the ration, and total feed consumption and total gain in body weight to 24 weeks increased with increasing levels of milk in the ration, although all groups grew at approximately equal rates from 10 to 24 weeks. The most efficient gains in body weight on the basis of dried skim milk intake were made by the chicks receiving the 1.25 and 2.5 percent levels. Age at sexual maturity decreased with increasing amounts of milk, while body weight at sexual maturity and percentage hatchability of fertile eggs increased with increasing milk levels. From the standpoint of egg production, egg weight, and hatchability the most efficient performance by laying pullets occurred at the 2.5 and 5 percent levels. Results at the 2.5 and 3.75 percent levels were essentially as satisfactory as the higher levels.

Factors influencing market quality and consumer value in poultry meat stock, W. A. Maw *(U. S. Egg and Poultry Mag., 45 (1939), No. 4, pp. 204–206, 244).*—In studies at Macdonald College, Canada, analysis of carcasses of different breeds of chickens and of the different sex and weight classes within breeds gave evidence that significant differences occur in the edible portion of the carcass within these various groups. Significant differences also existed in the relation of amount of body fat to edible meat, the percentage waste in dressing and drawing, and losses in cooking, all of which affect the use of the carcasses in the home for cooking and serving purposes.

The value of periodical trap-nesting, M. W. Olsen. (U. S. D. A.). *(Poultry Sci., 18 (1939), No. 3, pp. 232–235, figs. 2).*—An analysis of first-year trapnest records of 500 White Leghorn and 390 Rhode Island Red pullets gave evidence that the use of 1-day-a-week records would permit an estimation of actual production with a high degree of efficiency, the standard error of estimates being 18.6 in case of White Leghorns and 19.4 in case of Rhode Island Reds. Testing this method against the actual records of 100 pullets (not used in developing the equations), it was found that 44 percent of the calculated records were within 10 eggs, 58 percent within 15 eggs, and 85 percent within 25 eggs of the actual production. Using 1-day-a-week records through August 31 plus daily records for the remainder of the laying year only slightly improved the accuracy of estimation. The plan of trap-nesting 1 day a week is proposed as a serviceable basis for selecting the most prolific layers for practical poultrymen and progressive farm-flock owners.

The alternate white and yellow layers of yolk in hens' ova, R. M. Conrad and D. C. Warren. (Kans. Expt. Sta.). *(Poultry Sci., 18 (1939), No. 3, pp. 220–224, figs. 2).*—A study of the ovum growth rate throughout the day showed a very slight decrease in rate during the early morning hours, but not enough to indicate any very significant change in the rate of yolk metabolism. By using feeds of different xanthophyll content at different periods of the day alternate white and yellow bands were produced in the egg yolk of hens, while hens receiving a uniform diet throughout the day produced eggs of uniform color, indicating that the visible white and yellow bands frequently observed are the result of periodic intake of varying amounts of xanthophyll and not due to a variation in the rate of metabolism.

High-quality eggs for Illinois markets, H. H. Alp *(Illinois Sta. Cir. 494 (1939), pp. 31+[1], figs. 23).*—This circular offers practical suggestions for the

production, holding, packaging, and marketing of eggs. Principal topics of discussion are the chief causes of small and light eggs; the effect of rations on shell quality; problems concerning egg white, egg yolk, off-flavor, and other common defects; measurement of egg quality; candling technic; farm storage rooms and coolers; grading and packing eggs for market; and ways of preserving market quality.

The measurement of freshness of unbroken eggs, R. H. Carr. (Ind. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 3, pp. 225–231, figs. 2*).—A test for freshness of whole eggs based on the difference in buoyancy weight of fresh and stale eggs is reported. A special adaptation of the Jolly balance for determining differences in buoyancy weight and the significance of the "Jolly" egg number are fully described. The Jolly number of normal fresh eggs ranging from 50 to 70 gm. was found to be dependent on the dry weight of the yolk and the shell and membrane. The condition of the thick white had a very important effect on the Jolly number. Normal-sized eggs having a Jolly number of only from 25 to 45 are probably old eggs, with evidence that eggs undergo loss of about 1 Jolly number per day.

Storage of shell eggs, T. L. Swenson. (U. S. D. A.). (*Food. Res., 3 (1938), No. 6, pp. 599–608, figs. 3*).—A study was made of the effect of oil-treating eggs on their keeping quality. Eggs which were oiled under reduced air pressure showed a marked reduction in permeability (CO_2 evolution), and also markedly less decrease in percentage of thick white and less change in pH during storage as compared with untreated eggs. A large-scale experiment was conducted in which four lots of 200 eggs each were treated as follows: (1) No treatment, (2) oiled in an open immersion pan, (3) oiled as in (2) in oil charged with CO_2, and (4) oiled by the vacuum-CO_2 method. Half of each lot was put in cold storage immediately, while the other half was transported a considerable distance and then placed in cold storage. The decrease in grade during storage was very high in the untreated lots, considerably lower in lots 2 and 3, and markedly lower in lot 4, over two-thirds of the eggs in the latter group remaining in the two top grades.

The occurrence of mold on egg containers in storage at a Chicago plant, E. Toop (*U. S. Egg and Poultry Mag., 45 (1939), No. 7, pp. 397–399, 448*).—An examination of 349 cars of eggs held at 31° F. and 87 percent relative humidity for an average of 8 mo. showed that approximately 49 percent of these cars had some mold development, while the remaining 51 percent showed no evidence of mold. Only 6 percent of the cases were affected by mold at various stages of development. A similar inspection of 50 cars held at 31.5° and 86 percent relative humidity showed 14 percent of all cases attacked by mold. In no case was mold growth noted until after 5 mo. of storage. The variety of wood used in the construction of egg cases was an important factor in this regard, Sitka spruce proving most resistant to mold, while cottonwood was moderately resistant, and tupelo gum quite susceptible. The handling of egg cases prior to placement in storage and actual storage conditions were important considerations.

The vitamin D requirement of young turkeys, T. H. Jukes and T. D. Sanford. (Univ. Calif.). (*Jour. Nutr., 18 (1939), No. 1, pp. 71–85, figs. 2*).—In a series of experiments to determine the vitamin D requirement of young turkeys, the bone ash content of the tibia at 4 weeks of age as influenced by various levels of vitamin D in the diet was measured. Maximum bone ash values approximated 50 percent. U. S. P. reference cod-liver oil and a fish oil blend were used as sources of vitamin D. The blend contained about 450 units of vitamin D per gram as determined by chick assays based on the value of 95 units per gram for the reference cod-liver oil. The fish oil blend was more effective,

chick unit for chick unit, than the cod-liver oil as a source of vitamin D for poults, the efficacy ratio being about 1.4 : 1. Satisfactory growth and calcification in the complete absence of sunlight were produced when turkeys received 0.4 gm. of the fish oil blend per 100 gm. of diet, while significantly poorer calcification resulted when 0.3 gm. was used. Growth rate of poults was markedly influenced by the vitamin D content of the diet. While the vitamin D requirement of turkeys cannot be precisely stated in terms of A. O. A. C. chick units, the value of 200 chick units per 100 gm. of diet was approximately the amount required to support normal development of turkeys to 4 weeks of age.

The use of artificial lights for turkeys, H. L. Wilcke. (Iowa Expt. Sta.). (*Poultry Sci., 18 (1939), No. 3, pp. 236–243, figs. 3*).—Experiments extending over four seasons gave evidence that turkey females may be brought into earlier egg production by the use of artificial lights either in the morning and evening or all night. It required approximately 6 weeks for turkeys to reach a reasonably high level of production after the lights were turned on. The total number of eggs per bird to the end of June was increased by artificial lighting, while egg weight was not affected. Neither lighting nor heating had any significant influence on fertility or hatchability of the eggs. Total feed consumption was not affected by the use of either heat or light, but heating resulted in a much higher consumption of mash in proportion to grain as compared with the unheated groups.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle in Hawaii] (*Hawaii Sta. Rpt. 1938, pp. 65–68*).—Included are brief results of feeding tests on the value of algarroba bean meal for dairy cattle, and Sudan grass v. panicum grass or Rhodes grass as roughages for dairy cattle, by L. A. Henke and G. W. H. Goo.

[Experiments with dairy cattle and dairy products in Idaho] (*Idaho Sta. Bul. 229 (1939), pp. 10, 11*).—Progress results are briefly noted on the improvement in the average milk and butterfat production of Jersey and Holstein herds from the continuous use of proved sires and the influence of various factors on the solids-not-fat content of milk.

[Investigations with dairy cattle and dairy products in Indiana] (*Indiana Sta. Rpt. 1938, pp. 10, 11, 43–48, fig. 1*).—Included are brief reports of studies on the vitamin A requirements of cows for the production of butterfat with maximum vitamin A value, the effect of the vitamin A-suppressing factor in soybeans on the transference of the vitamin A per se from the ration to milk fat, and methods for the removal of the vitamin A-suppressing factor from soybean oil, all by S. M. Hauge, J. H. Hilton, and J. W. Wilbur; the influence of input to output in milk production (coop. U. S. D. A.), and the effect of feeds on the fat tests of milk, by Wilbur, Hilton, R. W. Bratton, and W. F. Epple.

Studies with dairy products, by E. H. Parfitt, W. H. Brown, B. E. Horrall, J. C. Crane, Epple, and Hilton, include the cause and remedies of some abnormal flavors in milk, particularly cappy flavor; the physical, chemical, and bacteriological factors affecting body, texture, and quality of ice cream; variations in the lecithin content of milk and its products; factors affecting the quality of Indiana butter; the effect of H-ion concentration, types of micro-organisms, and season on keeping quality of butter; the enzymes in sweet and sour farm-skimmed cream as related to keeping quality of the butter; and comparative studies of methods used in washing and sterilizing milking machines.

Marketing studies, by V. C. Manhart, K. C. Boxell, and Horrall, relate to the effects of quality and associated factors on returns secured by the producer of milk and cream, and consumer reaction to graded butter.

[Experiments in dairying at the North Louisiana Substation], R. H. LUSH (*Louisiana Sta., North Louisiana Sta. Bien. Rpt. 1937–38, pp. 30–32*).—Results are briefly noted on dairy-herd performance, returns from grazing dairy cattle on both winter and summer annual crops, the use of sweetpotatoes in dairy rations, the feeding value of dried sweetpotato pulp, and the response of permanent pastures to fertilization.

The effect of feeding a vitamin A supplement to dairy cattle, J. G. ARCHIBALD and C. H. PARSONS (*Massachusetts Sta. Bul. 357 (1939), pp. 14*).—In an extensive trial extending over 22 mo., the experimental herd of dairy heifers and cows was divided into two comparable groups, one of which received a vitamin A supplement in the form of cod-liver oil concentrate incorporated in the grain mixture while the other group under the same conditions of feeding and management received no supplement. There was no significant difference in the growth rate of heifers (past calfhood stage) in the two groups. There was only a slight difference in the reproductive efficiency of the two groups, but considering all phases the trend was in favor of the supplemented lot. The supplemented group had some advantage in milk production, expressed mainly by greater persistency in milk flow. The average butterfat content of milk was not significantly affected. The vitamin A content of the composite milk samples was higher for the supplemented group, although the transfer of this vitamin from feed to milk was very low in all cases. The addition of a vitamin A concentrate to the ration of dairy cattle is recommended as insurance against trouble due to a deficiency of this vitamin, particularly when the roughage was of poor quality.

Carotene in the nutrition of dairy calves, C. C. FLORA, R. E. WARD, S. I. BECHDEL, N. B. GUERRANT, and R. A. DUTCHER. (Pa. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 5, pp. 321–328, figs. 2*).—Young growing calves fed a ration of skim milk, a low vitamin A concentrate mixture, and poor-quality timothy hay developed vitamin A-deficient symptoms in a relatively short period. The addition of fresh carrots, artificially dehydrated alfalfa hay, or a commerial carotene concentrate to the basal ration was effective in preventing and curing the avitaminosis A. Calves receiving a ration high in cottonseed meal exhibited symptoms similar to those on the low vitamin A diet without cottonseed meal, although the former group developed the deficient symptoms in a much shorter time. This type of malnutrition was also readily corrected when carotene concentrate was added to the diet. The relative amount of vitamin A in the liver tissues corresponded closely to the quantity of carotene supplement administered.

The reproductive efficiency of dairy cattle, A. SPIELMAN and I. R. JONES. (Oreg. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 5, pp. 329–334*).—A numerical method of expressing the reproductive efficiency of dairy cattle is described. By applying this method to the breeding records of 368 cows, including four breeds, marked differences were found to exist in the reproductive efficiency of various cow groups and between breeds. The coefficient of correlation between the reproductive efficiency of foundation cows and the mean reproductive efficiency of their respective female descendants was found to be 0.546 ± 0.118, indicating the importance of selecting foundation cows with high reproductive efficiency.

The partition of the serum globulins of the dairy goat, E. P. REINEKE, V. E. PETERSON, and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Biol. Chem., 128 (1939), No. 1, pp. 1–7, figs. 3*).—Both arterial and venous samples of plasma from dairy goats were treated with a graded series of sodium sulfate solutions, ranging in concentration from 14 to 24 percent, to precipitate the globulins.

All precipitations were carried out at a dilution of 1 : 31. Solubility curves are presented, indicating the changes in solubility of the serum globulins at the various concentrations. Distinct breaks in the curve occurred at the concentrations of 15, 18.5, and 22.5 percent, indicating the partition of the globulin into fractions designated as euglobulin, pseudoglobulin I, and pseudoglobulin II at these respective concentrations. By narrowing the interval between sulfate concentrations, additional breaks in the curve were observed in the vicinity of 16.5 to 17 and at 20 to 21 percent. These are considered to represent subdivisions of pseudoglobulin I and pseudoglobulin II.

[**Abstracts of papers presented at the 34th annual meeting of the American Dairy Science Association**] (*Jour. Dairy Sci., 22 (1939), No. 6, pp. 411–436, 437–458, 459–465, 471–473, 477, 478*).—Following are listed the titles and authors of papers pertaining either to dairy manufacturing or dairy production, presented at the annual meeting of the association (E. S. R., 80, p. 94) held at Pullman, Wash., and Moscow, Idaho, June 27–30, 1939: The Use of Sodium Metaphosphate For the Preparation of Soft-Curd Milk, by C. Schwartz, K. K. Jones, T. W. Mack, and R. W. Vance (p. 411); Effect of Certain Sodium Salts Upon the Curd Tension of Milk, by P. H. Tracy and W. J. Corbett (pp. 411, 412) (Univ. Ill.); Further Studies of "Curd Surface" in Relation to the Digestibility of Milk, by L. A. Chambers, I. J. Wolman, and A. P. Hands (p. 412); Photochemical Study of the Irradiation Process of Producing Vitamin D in Milk, by M. J. Dorcas (p. 413); Effect of Concentrating Milk in the Vacuum Pan on the Development of Oxidized Flavors, by W. J. Corbett and P. H. Tracy (p. 413) (Univ. Ill.); Rates of Corrosion in Milk of Certain "White-Metal" Copper Alloys and Their Influence on the Flavor of Milk, by C. L. Roadhouse and J. L. Henderson (pp. 413, 414), and The Rate of Destruction of Vitamin C in Milk as an Index of the Solubility of Copper From Copper-Nickel Alloys, by J. L. Henderson and C. L. Roadhouse (p. 414) (both Univ. Calif.); The Effect of Winter and Summer Rations, and Cod-Liver Oil on the Oxidized Flavors and Vitamin C in Milk, by E. S. Guthrie (p. 415) (Cornell Univ.); Studies on Rancid Milk—Relation of Surface Tension of Rancid Milk to Its Acid Coagulation, by N. P. Tarassuk and F. R. Smith (pp. 415, 416) (Univ. Calif.); A Study of Some Factors Affecting the Viscosity of Market Cream, by F. M. Skelton and H. B. Ellenberger (pp. 416, 417) (Vt. Expt. Sta.); A Comparative Evaluation of an Ice Cream Supply as It Reaches the Consumer, by L. K. Crowe and P. A. Downs (pp. 417, 418) (Univ. Nebr.); Measuring the Quality of Ice Cream, by W. H. Martin, F. E. Nelson, and W. J. Caulfield (p. 418) (Kans. Sta.); Consumer Preference for Individual Chocolate Varieties, by P. S. Lucas and I. A. Gould (pp. 418, 419) (Mich. State Col.); The Use of the Petrographic Microscope in Studying the Different Types of Lactose Crystals as They Occur in Sandy Ice Cream, by W. S. Arbuckle, C. W. Decker, and W. H. E. Reid (p. 419), and The Use of Motion Pictures in Studying the Influence of Several Factors Upon the Stability of Ice Creams and Sherbets, by W. H. E. Reid, W. S. Arbuckle, and C. W. Decker (p. 420) (both Mo. Sta.); A Microscopic Technique for Studying Fat Globules in Dairy Products and Other Oil in Water Emulsions, by W. C. Cole and F. R. Smith (pp. 420, 421) (Univ. Calif.); The Effect of the New Standard Agar on the Plate Counts of Dairy Products, by F. E. Nelson (pp. 421, 422) (Kans. State Col.); The Development on New Standard Milk Agar of Certain Organisms of Importance to the Dairy Industry, by V. D. Foltz and F. E. Nelson (pp. 422, 423) (Kans. Sta.); Regulatory Legislation and Its Relationship to Research in Manufactured Dairy Products, by C. S. Trimble (p. 423) (U. S. D. A.); Studies With the Rollerless Churn, by W. B. Combs and S. T. Coulter (p. 424)

(Univ. Minn.); The Effect of the Ration on Butter Fat Constants, by A. H. Kuhlman and W. D. Gallup (p. 424) (Okla. A. and M. Col.); Some Observations on the Iodine, Reichert-Meissl, and Polenske Values of Milk Fat Produced During the Winter in Three Sections of Oregon, by R. E. Stout and G. H. Wilster (pp. 424, 425), and A Preliminary Report on Investigations to Overcome Crumbly and Sticky Texture in Butter Made During the Winter in the Irrigated Sections of Eastern and Southern Oregon, by G. H. Wilster, R. W. Stein, and R. E. Stout (pp. 425, 426) (both Oreg. State Col.); Copper in Butter, by B. E. Horrall and W. F. Epple (pp. 426, 427) (Purdue Univ.); Acid Values and Acid Ratios as Related to the Keeping Quality of Salted Butter, by H. A. Bendixen (pp. 427, 428) (Wash. Sta.); The Influence of Various Factors on the Reliability of the Room Temperature Holding Test for Butter Quality, by D. H. Jacobsen (p. 428) (S. Dak. State Col.); Laboratory Equipment for High Temperature Pasteurization Studies, by S. T. Coulter and W. B. Combs (p. 429) (Univ. Minn.); Correlation Between Grades on Scores and Grades on Criticisms in the Judging of Dairy Products, by G. M. Trout (pp. 429, 430) (Mich. State Col.); Standards for Rating Cheddar Cheese, by J. C. Marquardt (pp. 430, 431) (N. Y. State Sta.); Observations on the Growth Responses of *S[treptococcus] lactis* in Mastitis Milk, by C. C. Prouty (p. 431) (Wash. Sta.); Potentiometric Studies With Resazurin and Methylene Blue in Milk, by C. K. Johns and R. K. Howson (p. 431); Lactic Acid Streptococci of Cheese Starters, by B. A. Eagles and O. Okulitch (pp. 431, 432); Application of the Smear Culture Technique to the Examination of Cheddar Cheese (p. 432), and Relationship of Fat Hydrolysis to Flavor Development in Cheddar Cheese (pp. 432, 433), both by C. B. Lane and B. W. Hammer (Iowa State Col.); Some Factors Affecting the Moisture Content of Swiss Cheese and Their Effects Upon Quality and Yield, by G. P. Sanders and R. R. Farrar (pp. 433, 434) (U. S. D. A.); Further Studies on the Gas Requirements of Three Strains of Blue Mold (*Penicillium roqueforti* Group) Isolated From Cheese, by N. S. Golding (pp. 434, 435) (Wash. Sta.); The Lipolytic and Proteolytic Activities of Various Penicillia of Importance in the Ripening of Blue Cheese, by C. Jensen (N. Dak. Sta.); The Lactation-Promoting Properties of Proteins as Measured With Rats, by J. R. Haag and L. D. Wright (pp. 435, 436) (Oreg. Sta.); Some Factors Affecting the Reliability of Arterio-Venous Differences in a Study of Blood Precursors of Milk, by W. E. Petersen and W. L. Boyd (pp. 437, 438), The Respiratory Quotients of the Intact and Perfused Mammary Glands of Cows, by J. C. Shaw (pp. 438, 439), and Perfusion of the Excised Mammary Gland as a Method of Studying Milk Secretion, by W. E. Petersen, J. C. Shaw, and M. B. Visscher (pp. 439, 440) (all Minn. Sta.); The Effect of Ultraviolet Radiation on Milk Production, by W. E. Krauss, C. F. Monroe, C. C. Hayden, and B. H. Edgington (pp. 440, 441) (Ohio Sta. et al.); Studies on Milk and Fat Production of Dairy Cows and Goats as Influenced by Thyroxine, by N. P. Ralston, C. W. Turner, and A. C. Ragsdale (pp. 441, 442) (Mo. Sta.); Two Methods of Feeding Soybean Fat to Cows and Their Effect on Milk and Butterfat Production and on the Nature of the Butterfat, by N. K. Williams, C. Y. Cannon, and D. Espe (pp. 442, 443) (Iowa Sta.); The Effect of Sulfanilamide Therapy Upon the Catalase Activity of the Blood and Milk—A Preliminary Report, by P. G. Miller and G. W. Anderson (p. 444) (S. C. Sta.); The Effect of Ultraviolet Radiation of Cows on Their Agglutinin Titer for Bangs Disease, by B. H. Edgington, W. E. Krauss, C. F. Monroe, and C. C. Hayden (pp. 444, 445) (Ohio Sta. et al.); A New Routine Extending the Usefulness of the Hotis Test for Mastitis, by J. F. Cone (pp. 445, 446) (U. S. D. A.); The Classification of the Streptococci of Bovine Mastitis, by R. B.

Little and F. C. Minett (pp. 446, 447); Results of a Long Time Feeding Experiment on Bone Meal vs. No Bone Meal in a Dairy Ration Consisting of Timothy Hay, Corn Silage, and Concentrates, by S. I. Bechdel, P. S. Williams, A. A. Borland, and J. F. Shigley (pp. 447, 448) (Pa. State Col.); Making and Feeding Air Dried Hay to Dairy Heifers, by C. E. Wylie, S. A. Hinton, and J. W. Weaver, Jr. (p. 448) (Univ. Tenn. et al.); The Nutritive Value of an Alfalfa Hay Ration Compared With a Mixed Grass and Legume Hay and Grass Silage Ration for Dairy Cattle, by R. E. Hodgson and J. C. Knott (pp. 448, 449) (Wash. Sta. and U. S. D. A.); Studies With Alfalfa Hay for Milk Production, by I. R. Jones and J. R. Haag (pp. 449, 450) (Oreg. Sta.); Comparative Yields of Louisiana Field and Pasture Crops, by R. H. Lush (pp. 450, 451) (La. Sta.); Pasture Yields as Measured by Clip Plots and by Grazing Dairy Cows, by P. M. Brandt and H. P. Ewalt (pp. 451, 452) (Oreg. Sta.); The Chemical Composition and Nutrient Yield of Pasture Grass Grazed at Successive Intervals During the Season, by R. E. Hodgson and J. C. Knott (pp. 452, 453) (U. S. D. A. and Wash. Sta.); Some Relations of the Roughage Intake to the Composition of Milk, by E. B. Powell (pp. 453, 454); The Influence of Certain Rations and Management Practices on the Rate of Growth and Production of Holstein-Friesian Heifers, by H. A. Herman and A. C. Ragsdale (pp. 454, 455) (Mo. Sta.); Vitamin A and Carotene in Relation to Growth and Well Being of Heifers, by R. E. Ward and S. I. Bechdel (pp. 455, 456) (Pa. State Col.); Carotene Changes in Natural Cured, Artificially Dried, and Ensiled Roughages, by O. M. Camburn, H. B. Ellenberger, and G. C. Crooks (pp. 456, 457) (Vt. Sta.); Some Effects of Feeding Vitamin A and Carotene to Cows, on the Composition of Their Milk and Blood, by C. H. Whitnah, W. J. Peterson, H. W. Cave, and F. W. Atkeson (p. 457), The Effect of Feeding Vitamin A and Carotene to Cows on the Flavor of Their Milk, by H. W. Cave, W. H. Martin, and G. H. Beck (pp. 457, 458), and A Field Study of the Influence of Restricted Winter Rations on the Blood Calcium, Phosphorus, and Carotene of Dairy Cattle, by W. H. Riddell, F. W. Atkeson, W. J. Peterson, and W. W. Thompson (pp. 459, 460) (all Kans. Sta.); Rickets in Calves, A Regional Problem, by A. H. Kuhlman and W. D. Gallup (pp. 460, 461) (Okla. A. and M. Col.); Further Studies on the Vitamin D Deficiency of Mature Dairy Cows, by G. C. Wallis (pp. 461, 462) (S. Dak. Sta.); Vitamin E Studies With Male Rats, by A. O. Shaw, E. Woods, and J. O. English (pp. 462, 463) (Idaho Sta.); Are Urea and Other Simple Nitrogen Compounds Useful in Dairy Feeding? by E. B. Hart, G. Bohstedt, H. J. Deobald, and M. I. Wegner (pp. 463, 464) (Univ. Wis.); The Relation of the Rate of Disappearance of Milk Curd From the Calf's Abomasum to the Apparent Digestibility of Its Protein, by H. C. Dickey, D. Espe, and C. Y. Cannon (pp. 464, 465) (Iowa Sta.); Factors Affecting the Reactions of the Esophageal Groove of Dairy Calves, by G. H. Wise (p. 465) (S. C. Sta.); The Use of Various Oils and Fats for Calf Feeding, by T. W. Gullickson and F. C. Fountaine (pp. 471, 472) (Univ. Minn.); The Influence of Fineness of Grinding on the Digestion Coefficients of Oats for Dairy Cows, by G. C. Wallis, T. M. Olson, and T. A. Evans (p. 472) (S. Dak. Sta.); The Effect of Changes in Environmental Temperature on Water Consumption of Producing Dairy Cows, by W. M. Reagan and S. W. Mead (pp. 472, 473) (Univ. Calif.); Utilization of Proved-Sire Records and Herd-Analysis Data, by J. F. Kendrick (p. 477) (U. S. D. A.); and Utilization on State and County Basis, by W. Gifford (pp. 477, 478) (Mo. Sta.).

Proceedings, thirtieth annual meeting, November 29th and 30th, 1938 (*Amer. Butter Inst., Proc. Ann. Mtg., 30 (1938), vol. 2, pp. [91], pl. 1, figs. 38*).—The following listed papers are published in full in these proceedings: Copper

Contamination, by E. H. Harvey; The Physical State of Milk Fat in Relation to Behavior of Milk Products, by P. F. Sharp (Cornell Univ.); Application of the Phosphatase Test to Creamery Butter, by G. W. Shadwick, Jr.; Temperature's Relation to the Serving Quality of Butter, by W. H. E. Reid (Univ. Mo.); Significance of Mold Mycelia in Butter, by E. H. Parfitt (Purdue Univ.); and Bacteriological Defects of Butter, by B. W. Hammer (Iowa State Col.).

Standard methods for the examination of dairy products: Bacteriological, bioassay, and chemical (*New York: Amer. Pub. Health Assoc., 1939, 7. ed., pp. XI+190, [pl. 1], figs. 22*).—Publication of the seventh edition (E. S. R., 51, p. 579) of this well-known handbook is noted. The body of the text includes a historical introduction and sections on bacteriological methods, bio-assay of vitamin D milk, and chemical methods. An appended section on proposed phosphatase methods for the determination of pasteurization is also included.

An evaluation of the various procedures for making phosphatase tests, L. H. Burgwald and E. M. Giberson. (Ohio State Univ.). (*Jour. Milk Technol., 1 (1938), No. 7, pp. 11–24, fig. 1*).—A series of comparative tests gave evidence that the Kay and Graham, Gilcreas and Davis, and Scharer New York Laboratory tests are all nearly equal in effectiveness for detecting underpasteurization of milk, providing, however, that the standard for the New York Laboratory test is taken as 0.9 p. p. m. of phenol instead of 0.5 p. p. m. as recommended by Scharer. The time and cost of making tests favored the latter. The Scharer Improved Field test proved nearly as effective as any of the laboratory tests and had a distinct advantage of time and cost in its favor. The use of a photelometer improved the ease and accuracy of reading the test. It is considered unlikely that bacteria affect its accuracy. Samples could be held 4 or 5 days at refrigeration temperature without noticeably affecting the test.

Application of the rapid phosphatase test to dairy by-products, H. Scharer (*Jour. Milk Technol., 2 (1939), No. 1, pp. 16–20*).—Detailed directions are given for applying the rapid phosphatase test for efficiency of pasteurization to cream, butter, cheese, and ice cream.

The practical application of the phosphatase test, D. M. Roger (*Jour. Milk Technol., 2 (1939), No. 1, pp. 21–25*).—Evidence is presented to indicate that the Scharer Rapid Field test when properly applied is highly effective in detecting inefficient pasteurization of milk.

***A note on the suitability of various lots of dye for use in the resazurin* reduction test**, F. E. Nelson. (Kans. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 5, pp. 335, 336*).—A comparison of four brands of resazurin dye showed marked differences in solubility, color in stock solution and in acid and alkaline solutions, and color changes in milk. These findings suggest the need of standardization of the dye and of certification of different lots of dye by a responsible agency.

The relationship between fat content of fresh milk and its apparent acidity, K. W. Lines. (Univ. Ariz.). (*Jour. Dairy Sci., 22 (1939), No. 5, pp. 337–344*).—The data reported were obtained by determining the titratable acidity and butterfat content of daily individual cow samples of milk over a 4-mo. period. Cows of the Holstein, Guernsey, and Jersey breeds were included, and a total of some 1,300 samples were run. In general, the milks increased in apparent acidity as the fat content increased up to 6 percent, while above that level the acidity decreased. The titratable acidity of the milk tended to decrease with advance of the season from late February to July. Cows in advanced lactation and sick cows produced milk abnormally low in acidity, while cows in the first 30 days of lactation produced milk abnormally high in

acidity. An adjustment of the tolerance limits of acidity in market milk to account for the influence of fat content on apparent acidity is recommended.

Oxidized flavor in milk.—VII, Studies of the effect of carotene and ascorbic acid in the feed of the cow on the susceptibility of the milk to metal-induced oxidized flavor, W. C. Brown, A. H. Vanlandingham, and C. E. Weakley, Jr. (W. Va. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 5, pp. 345–351, figs. 5*).—Continuing this series (E. S. R., 81, p. 270), the carotene and ascorbic acid contents and susceptibility to oxidized flavor development were determined on individual milk samples from six cows during periods in which the cows were fed (1) the basal low-carotene ration, (2) basal plus fresh lemon juice or crystalline ascorbic acid, and (3) basal plus carotene concentrate. Adding ascorbic acid to the ration at the rate of 1 gm. per cow daily significantly reduced the tendency for metal-induced oxidized flavor to develop, but did not materially increase the ascorbic acid content of the milk. Adding 350 mg. of carotene per cow daily greatly reduced the tendency for oxidized flavor to develop and also markedly increased the carotene content of the milk. Adding carotene to the ration slightly increased the ascorbic acid in the milk, and, conversely, the ascorbic acid in the ration tended to increase the carotene content of the milk. The mechanism whereby oxidized flavor spontaneously develops is influenced apparently by some factor or factors other than a low carotene level in the ration.

Expulsion of air proposed to prevent destruction of vitamin C and development of oxidized flavor in milk, E. S. Guthrie, D. B. Hand, and P. F. Sharp. (Cornell Univ.). (*Milk Plant Mo., 28 (1939), No. 4, pp. 26–28*).—Tests on a large number of samples of fresh milk from individual cows showed a range from 7 to 41 mg. of ascorbic acid per liter (average 22.2). Similar tests on raw commercial milk samples about 3 days of age showed a range in ascorbic acid of from 0 to 19 mg. per liter (average 8.5), while pasteurized milk showed a similar range but an average of only 2.9 mg. Season and feed of the cow exerted little effect on ascorbic acid content of fresh milk, and pasteurization exerted little accelerative effect on this factor when other modifying variants were eliminated. There was a rather definite relationship between factors which accelerated the rate of oxidation of ascorbic acid and the production of oxidized flavor. Both the destruction of ascorbic acid and oxidized flavor development were largely or completely prevented by removing the dissolved oxygen from the milk.

Problems related to homogenized milk, F. J. Doan. (Pa. Expt. Sta.). (*Jour. Milk Technol., 1 (1938), No. 6, pp. 20–25*).—The effect of homogenization of milk on the size of fat globules, curd tension, susceptibility to tallowy flavor development, sediment, bacterial count, color, and other properties is discussed.

The relation of streptococcic mastitis to certain phases of milk sanitation, C. S. Bryan. (Mich. Expt. Sta.). (*Jour. Milk Technol., 2 (1939), No. 1, pp. 32–40, figs. 6*).—The relation of streptococci udder infections of dairy cows to the public milk supply and the need of proper milk ordinances to control this problem are discussed.

A glass milk bottle with narrow pouring lip and minimum drip, L. Arnold. (Univ. Ill.). (*Jour. Milk Technol., 1 (1938), No. 6, pp. 5–14, figs. 4*).—This article describes a standard pouring machine for milk bottles and a standard technic for determining the behavior of milk poured from glass bottles. Tests were conducted on a wide variety of pouring-lip designs on the amount of drip and bacterial contamination from bottles measured. A type of pouring lip giving a minimum drip during the pouring process is described.

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Sanitation of paper milk containers, J. R. SANBORN and R. S. BREED. (N. Y. State Expt. Sta.). (*Milk Dealer, 28 (1939), No. 7, pp. 36, 37, 88–91, figs. 3; abs. in Milk Plant Mo., 28 (1939), No. 5, p. 29*).—This discussion deals with the extent to which single-service milk and cream containers are used and the sanitation problems involved in their manufacture and use. Studies in a large number of milk plants indicated that single-service paper containers when made from essentially sterile stock and properly waterproofed and sterilized should be able to meet a standard of freedom from pathogenic organisms even more severe than those enforceable for our present milk containers.

Some factors influencing the amount of mold mycelia in butter, J. ADAMS and E. H. PARFITT. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 5, pp. 367–374*).—It was found that about 20 to 30 percent of the mold mycelia present in cream was retained in the butter made from that cream. Of various manufacturing operations studied, none had a significant influence on the mold mycelia content of butter. The mold mycelia fragments in butter serve as an index of the length of the holding time, temperature of storage, and oxygen relationships of the cream from which butter is made, but not as a direct index of the organoleptic quality of the cream.

The influence of hydrogen ion concentration and salt on the surface flora of Limburger cheese, C. D. KELLY and J. C. MARQUARDT. (N. Y. State Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 5, pp. 309–320, figs. 2*).—Yeast and *Bacterium linens* were previously found to be the predominating types of organisms in the slime of ripening Limburger cheese (E. S. R., 77, p. 693). Yeast was found to grow within a pH range of 3.5 to 8.5 (optimum 6.5), while *B. linens* grew within a pH range of 5.85 to 9.5 (optimum 6.5). In the early stages the surface pH of Limburger cheese falls to 5.0 or lower, which supports yeast but not *B. linens*. Yeast, acting on both protein and lactic acid, soon raises the pH above 5.85, at which time *B. linens* becomes established. A lower pH of the interior of the cheese and also lack of oxygen limits the growth of *B. linens* to the surface. The high concentration of surface salt evidently tends to inhibit the growth of organisms other than yeast and *B. linens*.

Studies on the control of gas in Limburger cheese, C. D. KELLY. (N. Y. State Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 5, pp. 299–307, figs. 6*).—Results of this investigation reveal that gas production in Limburger cheese, which is a serious problem, is due to the growth of *Escherichia coli* and *Aerobacter aerogenes* bacteria. Because of the relatively high temperature at which the cheese is held for the first 6 hr., the ratio of coliform organisms to other types increases rapidly so that a small number of these organisms in milk may cause excessive gas production in the cheese. Efficient pasteurization, either by the holding method or short-time, high-temperature method, effectively prevented the development of gas. Good quality cheese could be made from the pasteurized milk.

Water sorption by dry milk solids.—I, The effect of processing treatments on volume contraction, E. L. JACK. (Univ. Calif.). (*Jour. Dairy Sci., 22 (1939), No. 5, pp. 353–361, figs. 4*).—The volume contraction of dry milk solids prepared in various ways when immersed in an unlimited amount of water was measured at 20° C. in a dilatometer. The solids from milk preheated to 76.7° for 30 min. before drying showed greater volume contraction than comparable lots preheated at 60°, 71.1°, 82.2°, or 93.3°. Dry milk solids manufactured by the spray process showed greater volume contraction than those manufactured by the roller process. In general, the volume contraction was completed in from 20 to 22 hr. for spray-process and in from 24 to 28 hr. for roller-process samples. The significance of these findings is fully discussed.

The separation of fat in evaporated milk, B. H. Webb and G. E. Holm. (U. S. D. A.). (*Jour. Dairy Sci.*, *22* (*1939*), *No. 5*, *pp. 363–366*, *fig. 1*).—A study of the effect of certain manufacturing processes and storage time on the separation of fat in evaporated milk gave evidence that high single-stage homogenization pressure or 2-stage homogenization with a high initial pressure and control of the sterilization process to give a heavy-bodied milk were effective in retarding the separation of fat during storage at 28° C.

Preparation of ice cream mixes for home consumption, W. J. Corbett and P. H. Tracy. (Univ. Ill.). (*Food Res.*, *3* (*1938*), *No. 6*, *pp. 637–645*).—In an effort to develop an ice cream mix which would have a satisfactory body and flavor after canning and sterilization, 15 experimental mixes were prepared, processed, canned, and sterilized. The effect of temperature of sterilization, the relation of composition of the mix and homogenization pressures to heat coagulation, the effect of stabilizers and of egg yolk on heat coagulation, and the effect of storage temperature on certain physical and chemical properties of the sterilized mix were each studied. It was found that by preparing a mix from fresh high-quality dairy products, limiting the total solids to 36 percent and the serum solids to 9 percent, homogenizing at about 2,000–2,500 lb. on the first valve plus 500 lb. on the second, and using a short-time, high-temperature sterilization method, a satisfactory product resulted. Mixes properly flavored and sterilized had only a slightly cooked flavor. Preliminary offerings indicated a favorable consumer acceptance of such a product.

VETERINARY MEDICINE

Draft of an international list of animal diseases (*Pretoria: Govt.*, *1938*, *pp. 80*).—A tabular list arranged systematically under 18 headings, compiled by the South African National Committee of the Veterinary Research Institute at Onderstepoort, including P. J. du Toit, H. O. Mönnig, C. Jackson, and S. W. van Rensburg, at the request of the general secretary. An exhaustive index of 23 pages is included.

Infectious diseases of the domestic animals, L. Panisset (*Traité des maladies infectieuses des animaux domestiques. Paris: Vigot Bros.*, *1938*, *pp.* [*4*]+*562*, [*fig. 1*]).—The more important infectious diseases of livestock are dealt with in this work.

Complex infections, R. E. Shope (*Arch. Pathol.*, *27* (*1939*), *No. 5*, *pp. 913–932*).—Discussions of blackhead of turkeys (pp. 914–917), swine influenza (pp. 921–925), type III coryza of fowl (pp. 925–927), and infectious myxomatosis of rabbits (pp. 928–931) are included in this contribution.

[**Work in animal pathology by the Idaho Station**] (*Idaho Sta. Bul. 229* (*1939*), *pp. 11*, *24–26*).—The work of the year reported upon (E. S. R., 80, p. 101) relates to the treatment and prevention of streptococcic mastitis in dairy cows by the use of sulfanilamide (E. S. R., 80, p. 822) and tests for the detection of pullorum disease in poultry.

[**Work in animal pathology by the Indiana Station**], L. P. Doyle, A. L. Delez, F. L. Walkey, R. A. Craig, and C. E. Newton (*Indiana Sta. Rpt. 1938*, *pp. 84–87*, *fig. 1*).—Reference is made (E. S. R., 79, p. 679) to studies in 1938 of the transmission of paralysis and leucosis in chicks and of the death loss in newborn pigs; infectious abortion; abortions in clean herds; brucellosis studies in bulls; examination of cats for *Brucella* infection; laboratory diagnoses of poultry and livestock; agglutination tests for Bang's disease (brucellosis) and pullorum disease; and hog cholera serum and virus tests.

[**Work with animal diseases by the Nebraska Station**] (*Nebraska Sta. Rpt.* [*1938*], *pp. 33–35*).—The work of the year reported upon (E. S. R., 79, p.

535) relates to immunity studies of hog cholera and the nature of certain phases of swine erysipelas and the feasibility of simultaneous serum-culture inoculations in its prevention.

Live stock diseases report, No. 14, H. G. BELSCHNER (*N. S. Wales Dept. Agr., Livestock Diseases Rpt., 14 (1938), pp. 31*).—A report of control work during the year ended June 30, 1938 (E. S. R., 80, p. 250).

Bactericidal efficiency of certain aniline dyes, F. W. TILLEY. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *58 (1939), No. 12, pp. 941–946*).—The results of experimental work on the bactericidal efficiency of several aniline dyes against *Eberthella typhi, Escherichia coli, Salmonella pullorum, S. suipestifer,* and *Staphylococcus aureus* are reported, the details being given in tables. The findings indicate that "the addition of phenol or orthocresol to solutions of crystal violet or methyl violet 2B greatly increases their bactericidal efficiency against Gram-negative bacteria. There is little or no increase in efficiency against Gram-positive bacteria. The addition of phenol or orthocresol to solutions of brilliant green or malachite green has little or no effect on their bactericidal efficiency. The addition of sodium carbonate to aqueous solutions of crystal violet markedly increases bactericidal efficiency. The addition of sodium borate or disodium phosphate to such solutions produces little or no effect. In contaminated hog-blood mixtures kept at incubator temperature, crystal violet (1–2,000) with 0.02 M sodium carbonate appears to be uniformly ineffective, with 0.02 M disodium phosphate usually effective, and with 0.02 M sodium borate uniformly effective, in killing the contaminating bacteria."

Some observations on the toxicology of linseed plant (Linum usitatissimum Linn.), K. N. BAGCHI and H. D. GANGULI (*Indian Jour. Vet. Sci. and Anim. Husb., 9 (1939), No. 1, pp. 61–66*).—It was found that flax flowers with immature seeds, a fairly common source of cattle poisoning in Bengal and Bihar, contain the maximum amount of the cyanogenetic glucoside (producing as much as 0.69 percent of free hydrocyanic acid) and may be regarded as most potent cattle poisons. A half a pound of these flowers is sufficient to kill a bullock.

"Actinomycosis" and actinobacillosis in animals in India, M. Y. MANGRULKAR (*Indian Jour. Vet. Sci. and Anim. Husb., 8 (1938), No. 4, pp. 271–291, pls. 6*).—Included in this discussion is a description of a few cases from the bullock, buffalo, and dog in India.

Some experiments on the extra-corporeal hatching of the eggs of Ascaris suum, D. W. FENWICK (*Jour. Helminthol., 17 (1939), No. 2, pp. 69–82*).—Temperature, osmotic pressure, pH, and alkali were not in themselves sufficient to cause hatching of the eggs of *A. suum*. The digestive enzymes were incapable of inducing hatching, at least in vitro. "Agitation of the eggs cannot be considered as a biological method of inducing hatching, and it is therefore improbable that they throw any light on the process."

Comparative results of tube and plate tests for Bang's disease on suspicious animals, C. ELDER. (Mo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. [748], pp. 38–43*).—Comparative results on 12,006 blood samples, most of which had originally been found suspicious to the tube test, showed a rather close agreement when the results of the tube and plate methods were studied. "Comparative results did not show either test to be greatly superior in reducing the number of suspects, but a slightly smaller number of suspicious reactions were obtained by the plate method of testing. If readings in all cases with the plate method had been taken at the end of 8 min. instead of final readings, where delayed or slow reactions were observed, the number of suspects by this method would have been larger. On this particular group of samples studied,

a larger number of reactors were found with the plate method than by the tube method of testing. It was found, when comparing the two tests, that there was a great difference if one reported incomplete 1:50 reactions as nonreactors or as suspicious. The difference between results when incomplete 1:50 reactions are classified as nonreactors, as compared with results when they are classified as suspects, may in part account for some of the apparent variations in the agglutination test when reported by various laboratories. This study further illustrates the importance of uniform methods of testing and reporting results."

Accomplishments and difficulties in the control of Bang's disease, R. R. BIRCH (*Cornell Vet., 29 (1939), No. 2, pp. 173–181*).

Immunobiological studies on Brucella abortus Bang for establishment of a serviceable allergic diagnostic means, N. PLUM and C. RUSSEFF (*Skand. Vet. Tidskr., 29 (1939), No. 1, pp. 31–53, figs. 5; Dan. abs., p. 52*).—A contribution from the State Veterinary Serum Laboratory, Köbenhavn (Copenhagen).

Treatment of Brucella abortus infection with Fouadin and Prontosil, A. P. THOMSON (*Brit. Med. Jour., No. 4060 (1938), pp. 884, 885; abs. in Vet. Rec., 50 (1938), No. 52, p. 1780*).—Report is made of five cases of *B. abortus* infection in man, three of which were treated with Fouadin, a Bayer preparation containing a detoxicated complex salt of trivalent antimony and pyrocatechin, and four with Prontosil. All five showed high agglutination titers in their blood before treatment. The titer fell after treatment with Prontosil, and all apparently showed some benefit. The findings indicate that in the treatment of this disease both Prontosil and Fouadin are of value, and that Prontosil may prove to be a simple specific remedy when the patient can tolerate it in moderate doses (about 3 gm. daily) for a week.

Cheilospirura centrocerci, a new nematode from the sage grouse (Centrocercus urophasianus), F. SIMON. (Wyo. Expt. Sta.). (*Amer. Micros. Soc. Trans., 58 (1939), No. 1, pp. 78–80, figs. 3*).

The effect of X-ray on the coccidia of the rabbit, R. F. HONESS. (Univ. Wyo.). (*Science, 89 (1939), No. 2317, p. 486*).—A brief report is made of experiments which indicate that laboratory animals as well as valuable stock and pets may be freed from coccidia by the use of X-rays.

Avian hosts of eimerian coccidia, D. C. BOUGHTON and J. J. VOLK. (Univ. Ga.). (*Bird-Banding, 9 (1938), No. 3, pp. 139–153, fig. 1*).—The authors present a classified list of avian hosts with the respective species of the coccidian genus *Eimeria*. The host list includes 37 species of birds, which represent 31 genera, 13 families, and 8 orders. "For each of the 34 species of *Eimeria* which have been reported from these hosts brief notes are given on the following: Oocyst characteristics, tissue stages, prevalence and geographical distribution, pathogenicity, host specificity, and pertinent references. Of the 37 species of birds 4 are reported here for the first time as hosts of *Eimeria* sp. These are *Columba leucocephala, Zenaidura macroura carolinensis, Melopelia a[siatica] asiatica*, and *Oreopeleia chrysia*."

A bibliography of 42 titles is included.

Foot-and-mouth disease in man, A. FLAUM (*Acta Pathol. et Microbiol. Scand., 16 (1939), No. 2, pp. 197–213, pl. 1, fig. 1*).—This is a report of four cases of foot-and-mouth disease in man confirmed by animal experiments, presented with a list of 24 references to the literature.

Species of helminth parasites of domestic animals in Texas, H. L. VAN VOLKENBERG. (Tex. A. and M. Col.). (*Vet. Med., 34 (1939), No. 8, pp. 465–467*).

The effects of number and age of worms on development of primary and secondary infections with Hymenolepis diminuta in rats and an investiga-

tion into the true nature of "premunition" in tapeworm infections, A. C. Chandler (*Amer. Jour. Hyg., 29 (1939), No. 3, Sect. D, pp. 105–114*).—The results of experimental work with *H. diminuta* are reported.

A study of the rate of reproduction in the avian malaria parasite Plasmodium cathemerium, G. H. Boyd. (Univ. Ga.). (*Amer. Jour. Hyg., 29 (1939), No. 3, Sect. C, pp. 119–129, figs. 3*).—Observations on 30 infections of canaries with *P. cathemerium*, with information on the number of merozoites produced by the schizonts of this parasite in their process of schizogony and upon the rate of destruction of the parasites in these infections, are reported.

Mastitis: What do we know about it? E. C. McCulloch. (Wash. State Col.). (*Wash. State Col., Inst. Dairying Proc., 11 (1938), pp. 127–130*).—

Myiasis in domestic animals, E. W. Laake. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. [748], pp. 47–49*).—A practical discussion which includes measures of prevention and treatment.

A new prophylaxis for wound myiasis in domestic animals, M. A. Stewart (Univ. Calif.). (*Jour. Econ. Ent., 32 (1939), No. 3, pp. 404–407*).—The author has found that "a mixture composed of 25 percent acid free, dehydrated Stockholm pine-tar oil with a specific gravity of 1.075, 12.5 percent amorphous paraffin wax with a U. S. P. melting point of from 160°–170° F., and 62.5 percent viscous oil with the following specifications: Flash point Cleveland 540° maximum, viscosity at 100° Saybolt universal 144,200, viscosity at 210° Saybolt universal 2,900–3,200, pour point +50° maximum, color A. S. T. M. 2.0 maximum, carbon Conradson 0.5 percent maximum, sulfur bomb 0.5 percent maximum, and Sligh test 1.0 maximum, applied to wounds over an oakum substratum when a sinus is present and where a sinus is not present after the wound has been dried by the application of motor ether or tannic acid, affords efficient protection against myiasis and also greatly stimulates tissue repair in the wounds. Its prophylactic efficiency is based upon both a chemical repellent and a mechanical barrier, and wound drainage is not inhibited."

The viability of rinderpest goat blood virus at incubator temperatures, P. G. Malkani (*Indian Jour. Vet. Sci. and Anim. Husb., 9 (1939), No. 1, pp. 39–47, figs. 4*).—The author has found that citrated rinderpest goat blood virus alone is viable on the sixth day of incubation at 37° C.; when mixed with Voges Proskauer's solution and kept at 39°, it was viable on the fifteenth day but nonviable on the seventeenth day. Defibrinated blood virus mixed with Voges Proskauer's solution kept at 39° is viable on the thirteenth day but nonviable on the fifteenth.

Reversibility of the alpha and beta phases of Salmonella typhi, P. R. Edwards and D. W. Bruner. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 223, 224*).

"Hypo-HCl" treatment of scabies, W. S. Parker (*Lancet [London], 1939, I, No. 17, p. 987*).—Reference is made to the so-called hypo-HCl method of treating scabies. The skin is painted with a 25 percent aqueous solution of sodium thiosulfate, commonly known by photographers as "hypo," allowed to dry, and then painted with 5 percent hydrochloric acid. This is repeated, so that a single treatment consists of two alternate applications of hypo and acid, resulting in a very fine deposit of sulfur on the skin. All of the cases treated by the author cleared up after one treatment. The method is entirely free from discomfort or risk and may be applied anywhere.

A brief review of the species of schistosomes of the domesticated animals in India and their molluscan hosts, M. A. R. Rao (*Indian Vet. Jour., 15 (1939), No. 4, pp. 349–358*).

Studies on the bionomics and control of the bursate nematodes of horses and sheep.—VI, On the lethal effects of some nitrogenous chemicals on the free-living stages of Sclerostomes, I. W. PARNELL (*Canad. Jour. Res.*, *17* (*1939*), *No. 3, Sect. D, pp. 68–86, figs. 9*).—This further contribution (E. S. R., 80, p. 102) discusses the effect of 10 chemicals containing a nitrogen radicle on the free-living stages of Sclerostomes. "Chloropicrin is the most lethal chemical yet tested; under the conditions of these tests, one part of chloropicrin will sterilize approximately 2,300 times its weight of feces, but its disadvantages weigh against its practicability for farm use. Aniline will sterilize about 525 times its weight of fresh feces when undiluted and 800 or 900 times its weight as a very weak solution. Calcium cyanide, whose value is also limited by its danger, will sterilize 530 times its weight of fresh feces. Pyridine is slightly more effective when applied undiluted or as a strong or medium strength solution; it will then sterilize about 400 times its weight of fresh feces. Ammonium carbonate will sterilize approximately 50 times its weight of fresh feces. Ammonium chloride, cupric nitrate, and ammonium nitrate will sterilize approximately 30, 25, and 21 times their own weight of fresh feces, respectively. They are, however, more effective if applied as medium strength solution, and cupric nitrate in lesser amounts causes the death of many larvae after they have reached the third stage, although the chemical was added to the fresh feces. Ammonium sulfide, as a 15 percent solution, will sterilize nearly 14 times its weight of fresh feces. Saponin probably has no lethal value against Sclerostomes chemically, although physically it may affect them."

The pathogenic staphylococci, J. E. BLAIR (*Bact. Rev.*, *3* (*1939*), *No. 1, pp. 97–146*).—This contribution is presented with a bibliography of 263 titles.

The ticks of domestic animals in Britain, J. MACLEOD (*Empire Jour. Expt. Agr.*, *7* (*1939*), *No. 26, pp. 97–110, pls. 2, figs. 2*).—A practical summary of information.

Diseases transmitted by the Indian species of ticks and the possibility of their prevention through biological control, M. SHARIF (*Indian Jour. Vet. Sci. and Anim. Husb.*, *8* (*1938*), *No. 4, pp. 353–366*).—Presented in this contribution are lists of species of ticks (1) which are of considerable economic importance in India and attack domestic animals in large numbers, with their usual hosts, (2) which are found on domestic animals, but are of comparatively less economic importance, with their usual hosts, and (3) that have been involved in the transmission of diseases in India or in other countries.

On the presence of a buccal stylet in adult Trichinella, and the mode of feeding of the adults, V. D. VAN SOMEREN (*Jour. Helminthol.*, *17* (*1939*), *No. 2, pp. 83–92, fig. 1*).—A description is given of a functional buccal stylet occurring in adult male and female *T. spiralis*, and of the mode of feeding of the adults examined immediately on removal from the intestines.

The relative susceptibility of the field-vole to the bovine, human, and avian types of tubercle bacilli and to the vole strain of acid-fast bacillus (Wells, 1937), A. S. GRIFFITH (*Jour. Hyg.* [*London*], *39* (*1939*), *No. 3, pp. 244–259*).—Report is made of an epizootic disease among field voles (*Microtus agrestis*) in England resembling tuberculosis in its anatomical features but due to an acidfast bacillus different from the tubercle bacilli found in other species of warm-blooded animals. The study has led to the following conclusions: "(1) The vole is susceptible to infection with all the four types of acidfast bacilli used. (2) The bovine tubercle bacillus is the most virulent, and when injected parenterally or introduced by feeding gives rise to generalized progressive tuberculosis which runs a rapid course and is characterized by caseation of the lesions, especially the glandular, and great multiplication of

the bacilli. (3) The human tubercle bacillus can multiply in the tissues of the vole and cause death but does not, except locally and occasionally elsewhere, provoke tuberculous tissue changes leading to the formation of visible lesions. (4) The avian bacillus acts in much the same way as the human bacillus, having little tendency to produce macroscopic lesions. (5) The vole strain of bacillus can infect the vole through abrasions in the skin, or when taken with the food, or injected parenterally. The generalized disease produced experimentally by the vole bacillus is distingished from that set up by bovine bacilli by its more chronic course and by the occurrence in the areolar tissues of masses of necrotic or caseous substance largely composed of acidfast bacilli. (6) The vole appears to react in a characteristic manner (general lymph-gland caseation) to all strains of bovine tubercle bacilli, whether these are fully virulent for the rabbit or so reduced in virulence for that animal as not to be clearly distinguishable by the rabbit test from tubercle bacilli of the human type. (7) These results suggest that the vole may prove of great value in ordinary typing of tubercle bacilli and for testing strains which, though culturally bovine, have given equivocal results in rabbits."

Spontaneously acquired tuberculosis in rhesus monkeys, K. C. Smith-Burn (*Amer. Rev. Tuberc., 39 (1939), No. 5, pp. 675–682*).—In this work 18 strains of tubercle bacilli were isolated from as many cases of spontaneously acquired tuberculosis in rhesus monkeys. In about half the monkeys the primary lesion was apparently in the gastrointestinal tract. Fifty percent of the strains were of bovine type. Evidence was gathered which indicates that a portion, at least, of the animals were tuberculous when imported. The importation of tuberculous monkeys for zoological exhibition may constitute a public health hazard.

Immunity experiments on guinea-pigs with killed tubercle bacilli and BCG, A. S. Griffith and R. E. Glover (*Jour. Compar. Path. and Ther., 52 (1939), No. 1, pp. 57–68*).—In the experiments reported, each of the five vaccines—four of virulent tubercle bacilli killed by heat (60° and 120° C.), formalin, and glycerin, respectively, and one of B. C. G.—raised the resistance of the great majority of the guinea pigs to infection with virulent bovine bacilli. The increase of resistance was not of a high order and was effective in diminishing the extent and severity of the generalized tuberculosis in only 50 percent of the guinea pigs. In about two-thirds of the remainder the vaccine exercised only a slight retarding influence on the progress of the tuberculosis and in the rest none at all. On the whole the best results were given by B. C. G., one animal in this group showing lesions which were confined practically to the seat of injection and the adjacent glands, but there was little to choose between the results with the living vaccine and some of the dead vaccines.

Observations on the bovine blood picture in health and under parasitism, E. Delaune. (La. State Univ.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 482, 483*).—"Observations made on 6 normal Jersey and Holstein calves between the ages of 2 days and 6 mo. showed an average of 8.70 million red cells, 10,674 white cells per cubic millimeter of blood, and a differential leucocytic count as follows: Lymphocytes 64.4 percent, monocytes 12.2 percent, neutrophiles 19.6 percent, [and] eosinophiles 3.3 percent.

"Six counts made on each of 5 adult animals between the ages of 3 yr. and 6.5 yr., which were on range and which were considered to be normal from the standpoint of the absence of disease, revealed an average of 6.39 million red cells and 10,225 white cells per cubic millimeter of blood, with a differential leucocytic count of lymphocytes 58.1 percent, monocytes 8.0 percent, neutrophiles 25.9 percent, [and] eosinophiles 7.0 percent."

The bovine kidney in health and disease, R. Langham and E. T. Hallman. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. [748], pp. 22–32, figs. 24*).—Observations of the anatomy of the normal and diseased bovine kidney and the theory of kidney function are presented with a list of 11 references to the literature.

Some causes of abortion in cattle free from Bang's disease, H. L. Gilman (*Cornell Vet., 29 (1939), No. 2, pp. 153–165*).—Some of the various factors that have been known to interfere with the implantation and development to normal maturity of the bovine fetus, as well as others that were held under suspicion, are briefly considered, accompanied by a bibliography of 32 titles.

Coccidiosis, W. J. Gibbons and D. W. Baker (*Cornell Vet., 29 (1939), No. 2, pp. 182–191, fig. 1*).—Case reports of coccidiosis occurring in 10 herds of cattle are presented.

Three cases of bovine mastitis due to unidentified non-hemolytic streptococci, R. B. Little (*Cornell Vet., 29 (1939), No. 2, pp. 100–104*).—Report is made of the cultural characters of strains of unidentified (atypical) streptococci which were responsible for three acute cases of mastitis in a self-contained herd in New Jersey.

Experiments on the transmission of bovine contagious pleuro-pneumonia, with a report on a new method of testing immunity following vaccination, R. W. M. Mettam and J. Ford (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 1, pp. 15–28, figs. 4*).—The authors have found the intrajugular inoculation of agar plugs containing lymph or culture to be an effective and rapid method of producing, experimentally, lesions of contagious pleuropneumonia. In susceptible cattle there are often well-marked clinical symptoms following a period of incubation which averages 1 week. In more resistant animals symptoms are vague or absent even though there may be well-developed lesions in the thorax. "The vaccine test, although used on comparatively few animals, proved satisfactory and deserves a more extended trial. Out of the 10 test animals only 1 showed evidence of having reacted to the inoculation of embolus containing virus. In 2 control tests, 5 out of 10, respectively, showed extensive lesions of contagious bovine pleuropneumonia."

Detectable antibodies in the sera of cows affected with group-B streptococci, D. F. Stewart (*Austral. Vet. Jour., 15 (1939), No. 1, pp. 12–14*).—Report is made on the presence of antibodies in the sera of cows infected with group-B streptococci, to which no reference in literature has been found by the author.

The potency of synthetic medium tuberculin for use in the double intradermal test in cattle, R. F. Montgomerie and A. Thomson (*Vet. Rec., 50 (1938), No. 52, pp. 1759–1772*).—It was found that synthetic medium tuberculin (ammonium sulfate precipitated) as originally prepared in the authors' laboratories was too potent to be used in the double intradermal test. This tuberculin had some tendency to produce pseudo-positive reactions in clean cattle. "Diluted to a potency approximately equal to two-fifths International Standard Tuberculin, as judged by the guinea pig intracutaneous test, it (L. C. tuberculin) appeared suitable for this purpose."

Venereal infections of cattle: Their manner of spread and their eradication, S. H. McNutt and F. E. Walsh. (Iowa State Col.). (*Vet. Med., 34 (1939), No. 8, pp. 468–473, fig. 1*).—The nonspecific venereal infections of cattle are dealt with. A plan for the correction of such infections in individual herds is suggested.

Experiments in calves on immunity conferred by single and double injections of BCG in an oily excipient, J. B. Buxton and R. E. Glover (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 1, pp. 47–56*).—In further experi-

ments (E. S. R., 76, p. 849) "the subcutaneous inoculation of three calves with 5 mg. of B. C. G. incorporated in gum acacia and olive oil failed to induce an appreciable immunity to the oral administration of cultures of virulent tubercle bacilli 6 mo. later. When the dose of B. C. G. was increased to 50 mg., a moderate protection was obtained in three calves out of four. A reinforcing inoculation of B. C. G. given under the same conditions 12 mo. after a primary dose induced a partial protection to the same infecting dose administered 6 mo. after the second injection of the vaccine. There were marked individual differences, however, since three calves out of six were completely protected, while in the remainder the lesions were almost as severe as in the controls."

A study of the life-history and pathogenicity of Cotylophoron cotylophorum (Fischoeder 1901) Stiles and Goldberger 1910 of Indian ruminants and a biological control to check the infestation, H. D. Srivastava (*Indian Jour. Vet. Sci. and Anim. Husb., 8 (1938), No. 4, pp. 381–385, pls. 4*).—A contribution from the Imperial Veterinary Research Institute, Mukteswar-Kumaun.

The destruction of Lymnaea philippinensis for the control and eradication of fascioliasis in ruminants, Z. de Jesus (*Philippine Jour. Anim. Indus., 5 (1938), No. 6, pp. 581–595, pls. 6*).—Experimental control work with the intermediate snail host of liver flukes, parasitic to cattle and carabaos and abundant in most, if not all, of the larger islands of the archipelago, is reported. It is pointed out that since laboratory and field observations have shown that this snail and its eggs will not withstand desiccation, its destruction may be obtained by draining or by not irrigating its habitat during the dry season in places where there are two distinct seasons of the year.

A new system of anthelmintic control for gastro-intestinal parasites of ruminants, D. W. Baker (*Cornell Vet., 29 (1939), No. 2, pp. 192–197, figs. 2*).

A survey of the incidence of surra in Philippine cattle and carabaos by complement fixation test.—Preliminary report, T. Topacio and R. A. Acevedo (*Philippine Jour. Anim. Indus., 5 (1938), No. 6, pp. 597–604, fig. 1*).—The results obtained in a preliminary survey of the incidence of surra in cattle and carabaos by the complement-fixation test are reported. They are said to indicate a necessity for further continuance of the work in order that the entire archipelago may be covered to obtain a factual picture of the surra situation in the various localities.

A note on Anaplasma and on Bartonella sturmani sp. nov. in the buffalo, K. Grinberg (*Ann. Trop. Med. and Parasitol., 33 (1939), No. 1, pp. 31–36*).—A description is given of a natural infection in splenectomized buffaloes by a parasite morphologically indistinguishable from *A. marginale*. This parasite from young buffaloes from the Huleh swamps of Palestine was transmitted to calves by direct blood inoculation, the infection in the calf being indistinguishable from natural infections of *A. marginale*. A description is also given of a new species of a *Bartonella* (*B. sturmani*) from a splenectomized buffalo, which can be transmitted by direct blood inoculation from buffalo to buffalo, but not from buffalo to calf.

Notes on a hitherto unreported acarine parasite of carabao in the Philippines, L. M. Yutuc (*Philippine Jour. Anim. Indus., 5 (1938), No. 4, pp. 363–367, pls. 3*).—A description is given of the acarine parasite *Psoroptes communis bovis*, first observed in the Philippines in 1912 in a shipment of carabaos from Taiwan (Formosa). A brief report is made on its experimental transmission, symptoms, and treatment.

Diseases of breeding ewes, A. Leslie (*Auckland, New Zeal., and London: Whitcombe and Tombs, 1938, pp. 147, [figs. 17]*).—The subject is dealt with in

three sections under the headings of diseases and disorders of pregnancy (pp. 7–60), parturition (pp. 61–113), and lactation (pp. 114–144).

Investigations on Johne's disease of sheep, A. D. McEwen (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 1, pp. 69–87*).—Report is made of an outbreak of Johne's disease in a flock of sheep, the symptoms and lesions of the affected sheep being described. The causative organism resisted cultivation and so differed from the Johne bacillus isolated from cattle. The infection was readily transmitted to lambs, but adult sheep were resistant. Six calves exposed to heavy infection all became infected. Johnin diagnostic tests carried out on sheep and on the experimental cattle were unsatisfactory.

The control of stomach worms in sheep in eastern Canada, W. E. Swales (*Canada Dept. Agr. Pub. 639 (1939), pp. 7, figs. 3*).

A new technique for counting nematode eggs in sheep faeces, H. M. Gordon and H. V. Whitlock (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 1, pp. 50–52, fig. 1*).—A description is given of a method by which the work of counting nematode eggs in sheep feces is simplified and the time required for each sample reduced about one-half.

Efficacy of commercial phenothiazine in the removal of roundworms from sheep, P. D. Harwood, R. T. Habermann, and A. C. Jerstad. (U. S. D. A.). (*Vet. Med., 34 (1939), No. 7, pp. 440–443, fig. 1*).—In experiments reported, "commercial phenothiazine, which contains about 95 percent of this compound, removed 76.7 percent of the hookworms and 90.9 percent of the nodular worms from eight sheep when the substance was administered at the rate of 0.5 gm. per pound of body weight. Commercial phenothiazine at a dose rate of 0.25 gm. per pound of body weight was much less effective in two animals than when given at a dose rate of 0.5 gm. per pound of body weight. The chemical appears to have been 100 percent effective for the removal of *Ostertagia* and fairly effective for the removal of *Haemonchus*. A practical method for the administration of phenothiazine to sheep has not been developed, but further work in this direction is in progress."

Stiff lamb disease in Michigan, L. B. Sholl. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. [748], pp. 108, 109*).—Report is made of cases of stiff lamb disease observed in Michigan during the spring of 1939, when losses from this affection were very heavy—some farmers having reported loss of almost 30 percent of the lamb crop. The findings have led the author to conclude that the condition should be prevented by supplying palatable concentrated mixed feed to the lambs rather than allowing them to eat large quantities of hay.

Hog cholera immunization in pigs on low vitamin-B-complex intake, E. H. Hughes and H. S. Cameron. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. [748], pp. 106, 107*).—The experiments reported, although conducted with but few animals, indicated that the immunity produced by serum and virus in pigs on a low vitamin B complex intake was solid where other conditions were satisfactory.

Swine dysentery and Salmonella, W. L. Hindmarsh, D. F. Stewart, and L. Hart (*Austral. Vet. Jour., 15 (1939), No. 1, pp. 27–30*).—Serological evidence presented by the authors indicates that swine dysentery is not due to an infection by *S. cholerae-suis kunzendorf*.

An intermediate host for the swine influenza virus, R. E. Shope (*Science, 89 (1939), No. 2315, pp. 441, 442*).—It is pointed out that swine influenza is a disease in which two infectious agents, one a virus and the other a bacterium, are etiologically essential, and that there is no satisfactory explanation of how or where the disease persists during the 8 or 9 mo. elapsing between the yearly epizootics. While the bacterial component of the etiological complex, *Hemo-*

philus influenzae suis, can persist apparently indefinitely in the upper respiratory tracts of some recovered swine, similar persistence of the virus cannot be demonstrated. The origin or source of swine influenza virus responsible for fresh epizootics each autumn has remained obscure, and it is with the epidemiology of these first cases that the experiments here briefly outlined are concerned. The findings are tentatively interpreted in the following way: "Lungworm larvae from pigs with swine influenza harbor swine influenza virus throughout their development both in their intermediate host, the earthworm, and in their definitive host, the swine. The virus apparently lies latent within the lungworm after the parasite has finally migrated to the swine respiratory tract and is only liberated or activated to cause infection when a provocative stimulus is applied. In the experiments just outlined multiple intramuscular injections of *H. influenzae suis* are believed to have supplied the provocative stimulus. *H. influenzae suis* does not, however, appear to be specific or requisite as the provocative agent because, in a preliminary experiment, a single intrapleural injection of calcium chloride solution has served equally well in provoking the swine influenza virus infection."

Quantitative studies on the effect of heat on trichina (Trichinella spiralis) larvae, G. F. Otto and E. Abrams (*Amer. Jour. Hyg., 29 (1939), No. 3, Sect. D, pp. 115–120*).—The experiments reported support previous work in indicating that trichina larvae are not injured by temperatures which could be tolerated by the host, and verify the work of Ransom and Schwartz (E. S. R., 41, p. 684) that 55° C. is the minimal temperature which quickly kills practically all larvae. It is concluded that the Federal requirement of 137° F. (58.3° C.) in the heat-processing of pork offers an adequate margin of safety.

Sulphonamide treatment of facial sinus infection in the horse, J. F. MacDonald (*Vet. Rec., 51 (1939), No. 20, p. 638*).—This is a case report of a facial sinus infection of a 6-year-old gelding that was relieved by administration of 30 cc. of a 20 percent solution of sulphonamide subcutaneously daily for 10 days.

Moldy corn poisoning (leucoencephalomalacia) in horses with history of previous attack as well as recovery from virus encephalomyelitis, H. E. Biester and L. H. Schwarte. (Iowa State Col.). (*North Amer. Vet., 20 (1939), No. 6, pp. 17–19, figs. 2*).—A case report of moldy corn poisoning in Iowa.

Notes on the New England outbreak of equine encephalomyelitis, R. Randall ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 33 (1939), No. 2, pp. 87–95*).—A brief summary is given of some of the available epidemiological data on equine encephalomyelitis as met with in New England, where its spread through human beings has occurred, as reported by Fothergill et al. (E. S. R., 80, p. 397).

The causative agent of infectious equine encephalomyelitis in Venezuela, V. Kubes and F. A. Ríos (*Science, 90 (1939), No. 2323, pp. 20, 21*).—Report is made of a study of the causative agent of infectious equine encephalomyelitis conducted at the Laboratories of Veterinary Bacteriology and Parasitology of Venezuela. From the comparative researches conducted both in vivo and in vitro, it is concluded that "the Venezuelan encephalomyelitic virus is wholly different both from the American western virus and from the Argentine virus, with which it has no immunobiological connection; that it also differs immunobiologically from the American eastern strain virus, with which, however, it has some connection on account of its high virulence, pathogenicity, etc.; that the immunizing power of the protective vaccine made from autochthonous virus surpasses by far that of the American bivalent vaccine, prepared from both eastern and western viruses; [and] that the Venezuelan encephalomyelitic serum neutralizes the corresponding specific virus, not only in vivo, but also in vitro."

Transmission of encephalomyelitis in the horse and possible vectors in the human being, J. S. SIMMONS (*New England Jour. Med., 220 (1939), No. 23, pp. 956–958*).

"Secondary" disease occurring subsequent to infectious equine encephalomyelitis, M. S. SHAHAN, L. T. GLITNER, C. L. DAVIS, and W. T. HUFFMAN. (U. S. D. A.). (*Vet. Med., 34 (1939), No. 6, pp. 354–358, fig. 1*).—A brief clinical, epizootiological, and pathological description is given of the secondary disease which follows infectious equine encephalomyelitis as reported upon by Madsden (E. S. R., 73, p. 108) and Marsh (E. S. R., 78, p. 108). Attempts to produce the disease by inoculation of laboratory animals and horses with tissues from typical clinical or recovered cases were unsuccessful. One of several normal horses injected with encephalomyelitis antiserum developed mild, but apparently typical, clinical evidence of the disease.

Present status of equine encephalomyelitis and its control, B. M. LYON (*Cornell Vet., 29 (1939), No. 2, pp. 198–216*).—A practical summary of the present status of knowledge of this serious disease. It is pointed out that the vaccine produced by Wyckoff and associates from the diseased chicken embryo, accounts of which have been previously noted (E. S. R., 80, pp. 254, 255), has rendered the diseased horse brain vaccine obsolete because of the greatly increased protection which it induces. "This new 'chick' vaccine has consistently demonstrated 100 percent protection in horses against direct intracerebral virus exposure which killed not only all unvaccinated horses but likewise those vaccinated with the diseased horse brain vaccine. Protection established in horses by 2 doses of the chick vaccine is still complete at the end of 6 mo. against intracerebral virus exposure which is fatal to all unvaccinated horses. From a single dose, horses are temporarily protected by the seventh day following administration but may become infected prior to the seventh day from both natural and artificial exposure. The immunity acquired from a single injection is of short duration, and within 2 mo. animals so vaccinated again become susceptible and succumb to intracerebral exposure as readily as those unvaccinated. Field results with the new chick vaccine during 1938, following the use of well over 1,500,000 doses, correspond directly with the results of experimental tests. The chick vaccine was shown to be a relatively [stable] product at refrigeration temperature but much less so at higher temperatures, thus showing the necessity of constant refrigeration."

Recently acquired knowledge concerning equine encephalomyelitis and its relationship to the problem of control, W. S. GOCHENOUR (*North Amer. Vet., 20 (1939), No. 6, pp. 20–25, 26*).

Sulfanilamide in the treatment of infectious anemia, W. S. GOCHENOUR, C. D. STEIN, and O. L. OSTEEN. (U. S. D. A.). (*Vet. Med., 34 (1939), No. 7, pp. 424–430, figs. 2*).—A report is made of tests to determine the action of sulfanilamide on normal horses, the effect of large doses of sulfanilamide, and the effect of sodium sulfanilyl sulfanilate.

Studies upon Strongylus vulgaris.—I, The incidence of Strongylus vulgaris in mid-continental North America and the reaction of the infested ceca, J. H. WHITLOCK and E. E. LEASURE. (Kans. Expt. Sta.). (*Amer. Jour. Hyg., 29 (1939), No. 3, Sect. D, pp. 83–87*).—It was found in a series of observations upon 174 horses killed at a meat packing house in midwestern North America that 84 percent were infested with *S. vulgaris* in the cecum. Twenty percent of the horses had infestations which were probably extremely harmful to the host.

Treatment of trichostrongylosis in foals, D. W. BAKER, A. G. DANKS, and J. W. BRITTON (*Cornell Vet., 29 (1939), No. 2, p. 238*).—Report is made of the

success in treating *Trichostrongylus axei* by use of a solution consisting of 1 percent of copper sulfate and 1 percent of nicotine sulfate. From 300 to 325 cc. was administered through a stomach tube to foals that had been starved for 12 hr. No toxic effects of any sort were noted in any of the foals receiving the treatment, and it appears that horses tolerate this dose of copper sulfate-nicotine sulfate mixture well.

Studies on the transmission of Dirofilaria immitis in Massachusetts, J. H. PHILLIPS (*Amer. Jour. Hyg., 29 (1939), No. 3, Sect. D, pp. 121–129, figs. 4*).—The author found that the transmission of heartworm in the dog at Boston, Mass., was linked with six species of mosquitoes (*Anopheles punctipennis*, the common malarial mosquito, *Aedes excrucians, A. cinereus, A. triseriatus*, and *Culex territans*). "Fleas did not appear to be vectors of *D. immitis*. Mosquitoes do not develop immunity to reinfection with *D. immitis*. Reinfection was observed in *Anopheles punctipennis, Aedes cinereus*, and *A. triseriatus*. Stableflies (*Stomoxys calcitrans*) ingest microfilariae when feeding on infected dogs. It is problematical whether they are susceptible hosts."

On the relationship between "Lahore canine fever" and "tick fever" of dogs due to P[iroplasma] gibsoni infection, with observations on their pathology and haemocytology, J. F. SHIRLAW (*Indian Jour. Vet. Sci. and Anim. Husb., 8 (1938), No. 4, pp. 293–316, pls. 4, figs. 7*).—A contribution from the Imperial Veterinary Research Institute, Mukteswar-Kumaun.

Leptospirosis in dogs, W. S. MONLUX (*Cornell Vet., 29 (1939), No. 2, pp. 217–221*).—In reporting upon this European disease of the dog, which has appeared in the United States in the last several years, it is pointed out that vaccines have been used quite successfully in immunizing against the leptospiral infection.

A preliminary report on the use of nicotinic acid in the treatment of fuso-spirochetal disease of dogs, M. L. MORRIS and C. E. FRANKLIN (*North Amer. Vet., 20 (1939), No. 6, pp. 31, 32, 33*).—Nicotinic acid, which has recently proved of value in the treatment of canine blacktongue, now appears to be of value in the treatment of Vincent's disease in the dog.

Critical tests of iso-amyl-ortho-cresol as an anthelmintic for the removal of tapeworms from dogs, A. C. JERSTAD. (U. S. D. A.). (*North Amer. Vet., 20 (1939), No. 6, pp. 35–37, 38*).—Experiments reported have led to the conclusion that "isoamyl-o-cresol cannot be regarded as an effective agent for the removal of *Dipylidium caninum* of the dog. Isoamyl-o-cresol is not effective for the removal of *Taenia pisiformis, Ancylostoma caninum*, and *Trichuris vulpis*. Isoamyl-o-cresol is more effective against *Toxocara canis* than against other parasites encountered, but it does not compare favorably with standard drugs already in use for the removal of this parasite."

Preliminary notes on a hitherto undescribed poultry disease, Y. S. GRASOVSKY (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. [748], pp. 71, 72, figs. 7*).—A description is given of a disease which appeared among young Rhode Island Red pullets and occasionally hens of the same breed on a large poultry farm in Palestine. While resembling the infectious purulent enteroproventriculitis studied at the North Carolina Experiment Station by Kaupp and his associates (E. S. R., 60, p. 375), well-defined differences were detected.

A pathogenic Trichomonas from the upper digestive tract of chickens, N. D. LEVINE and C. A. BRANDLY. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. [748], pp. 77, 78, figs. 2*).—A description is given of an affection of the upper digestive tract of chickens associated with *Trichomonas*. The gross pathological lesions observed in naturally affected chickens resemble the trichomonad lesions encountered in pigeons and turkeys. The morphology of

and preliminary animal exposure experiments conducted with the causative *Trichomonas* indicate that it may be a strain of *T. columbae*.

Immunisation of birds against fowl pox and pigeon pox, respectively, with viruses propagated on the chorio-allantoic membrane of the developing egg., R. E. GLOVER (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 1, pp. 29-46*).—Report is made of work conducted with a strain of pigeon pox virus that has been maintained on the chorioallantoic membrane of the hen's egg for 50 generations. "The virus has become slightly attenuated for the pigeon but induces good dermal lesions in the fowl. It shows no signs of enhanced virulence for poultry. Similarly, a fully virulent fowl pox strain has been carried through 38 generations. It still fails to induce lesions in the pigeon and shows some evidence of attenuation for the fowl. Membranes infected with pigeon virus can be stored in broth at a temperature of 0° to 4° C. There is a gradual loss in infectivity, but lesions are still obtainable in the egg and in the pigeon after 380 days. Fowl virus is also relatively stable under similar conditions. Pigeons which have received a single dose of egg membrane virus by the intradermal, intraperitoneal, or intravenous routes show a fairly durable immunity which can be reinforced by a second dose of virus. The subcutaneous route is less effective. In fowls the intradermal application of the egg virus appears to be as satisfactory as natural virus for the immunization of the fowl, but the immunity shows signs of waning after about 6 mo. The immunity can be reinforced by a second injection of pigeon or fowl virus given intravenously or intraperitoneally. There is a slight indication that fowl virus is the more effective."

On the nature of the agent causing leucosis in fowls, K. G. STERN and A. KIRSCHBAUM (*Science, 89 (1939), No. 2322, pp. 610, 611, fig. 1*).—The studies of the virus of fowl leucosis here reported upon have led to the conclusion that with respect to its chemical and physical properties the material described resembles the causative agent of the Rous chicken tumor I, reported upon by K. G. Stern and F. Duran-Reynals,[6] and also the macromolecular material isolated by A. Claude[7] from normal chick embryos. In contrast to the virus proteins isolated by Stanley and others (E. S. R., 81, p. 52) from plants, these materials do not represent pure nucleoproteins but much more complex chemical structures of the type encountered in the analysis of protoplasm.

Failure of wheat germ oil to prevent lymphomatosis in chickens, L. W. TAYLOR and K. B. DEOME. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. [748], pp. 73-76*).—Data presented, the details of which are given in tables, are considered to show clearly that under the conditions of the experiment the feeding of wheat-germ oil had no appreciable effect on the incidence, type, or age of onset of lymphomatosis. "In this experiment the genetic constitution of the stock was responsible for the differences observed in the incidence of lymphomatosis. This conclusion is in agreement with previous work on this flock, wherein the principal identifiable variable associated wth the disease was of genetic nature." A list is given of 11 references to the literature.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Idaho Station] (*Idaho Sta. Bul. 229 (1939), pp. 20-22*).—The report notes briefly work on drainage of irrigated lands and methods of reducing canal losses, use of the press-type furrow drill in dry farming, harvesting equipment for beans and peas and for

[6] Science, 89 (1939), No. 2322, pp. 609, 610, fig. 1.
[7] Soc. Expt. Biol. and Med. Proc., 39 (1939), No. 2, pp. 398-403, fig. 1.

wheat, the commercial type beet combine harvester, and the bed method of seedbed preparation and cultivation.

[Agricultural engineering investigations of the Indiana Station] (*Indiana Sta. Rpt. 1938, pp. 15–19, 20–26, figs. 9*).—This report contains notes on the adaptation of the Purdue plow trash shield to 4 more plows, making the device now available for 33 plows, by R. H. Wileman; successful trial of a home-made subsurface shaver for killing out Canada thistle and the use of the duck-foot cultivator for control of this weed, by Wileman and O. C. Lee; rubber tires v. steel wheels for tractors and seed-corn drying, both by Wileman; a combined harvester thresher, a study of atmospheric corrosion on wire and wire products, field ensilage harvester, a study of low-pressure pneumatic tires on power-driven manure spreader, and experimental dairy barn, all by I. D. Mayer; poultry house heating, by Mayer and C. W. Carrick; electric heaters for apple washers, wind electric plants, electric pig brooders, and electric dairy water heaters, all by T. E. Hienton and J. M. Fore; use of electric energy in brooding chicks, by Hienton, Fore, and S. Hinners; storage problems in marketing sweetpotatoes, by Hienton, F. C. Gaylord, and J. A. McClintock; precooling fresh fruits in refrigerator cars, by Hienton, K. I. Fawcett, and Gaylord; use of electric illumination for forcing crops in commercial greenhouses, by Hienton and R. B. Withrow, codling moth control with electric traps, by Hienton and G. E. Marshall; use of electric heat in automatic drinking fountains in experimental hog lots, by Hienton, Fore, and C. M. Vestal; and use of electric traps as a possible control for European corn borer and other field crop insects, by Hienton, Fore, and G. A. Ficht.

[Agricultural engineering investigations by the Nebraska Station] (*Nebraska Sta. Rpt. [1938], pp. 5–7*).—This report contains brief notes on use of electric power on Nebraska farms, cooling milk on the farm by a "dry" type portable cabinet, mechanical equipment needed in the eradication of bindweed, adaptability of electric hotbeds to farm use, adaptation of insulated electric brooders in uninsulated poultry houses, and methods and equipment for storing eggs under controlled temperature and humidity.

Ground water resources, K. Engler and D. G. Carter. (Ark. Expt. Sta. et al.). (*Agr. Engin., 20 (1939), No. 7, pp. 263, 264, 266, figs. 3*).—In a 10-yr. study of the ground water conditions in the Grand Prairie of Arkansas, the irrigation water requirement amounted to approximately 20 acre-in. per year, on an average of 124,000 acres of rice per year, 90 percent of which was pumped from the Pleistocene sands. The withdrawal of water has resulted in a lowering of the ground water by an average of 0.8 ft. per year. However, the decline varies with seasonal rainfall, acreage, and location. A continuous chart record affords evidence of a gradual and persistent decline of the ground water level and shows annual, seasonal, and daily fluctuations. It is evident that under present conditions the safe yield of the Pleistocene sands is being exceeded each year. Additional research is under way to determine the safe yield and the possibility of developing economical surface supplies of irrigation water.

Watershed and hydrologic studies on the Blacklands experimental watershed, R. W. Baird. (U. S. D. A.). (*Agr. Engin., 20 (1939), No. 7, pp. 273–276, figs. 6*).—This is a brief description of the equipment and technic being employed in this U. S. D. A. Soil Conservation Service research project near Waco, Tex.

A study of temperatures under sheet steel roofs, H. Giese, W. D. Scoates, and N. C. Ives. (Iowa Expt. Sta.). (*Agr. Engin., 20 (1939), No. 7, pp. 267–270, figs. 7*).—A brief description is given of the technic and equipment employed in this study.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Indiana Station, 1938] (*Indiana Sta. Rpt. 1938, pp. 58–61, 79, 80, figs. 2*).—Findings not previously noted are reported as follows: Additional findings (E. S. R., 79, p. 691) by J. C. Bottum in studies of farm organization in central Indiana and combine harvester thresher costs; by E. C. Young on cost of winter broilers; and by O. G. Lloyd and J. R. Hays on the relative income on farms operated under different types of tenure; and general findings by L. S. Robertson as to the effects of size of farm, yields, prices, amount of livestock, and returns per $1 worth of feed fed on labor income on northwestern Indiana farms; by Robertson, Young, Hays, and M. O. Pence on the adjustments needed on 213 Knox County farms; by T. R. Cowden as to use and costs of operation of trucks on 262 farms; by Robertson and M. G. Smith as to costs, labor requirements, and returns in 1937 on 52 farms growing peppermint; and by E. R. Menefee as to the buying and the possibilities of retailing eggs on the grade basis.

Economic studies of vegetable farming in New York.—VI, Production and marketing of celery, 1936, J. N. Efferson ([*New York*] *Cornell Sta. Bul. 715* (*1939*), *pp. 62, figs. 10*).—Continuing this series (E. S. R., 80, p. 408), cost records were obtained from 100 enterprises in Wayne County in the northwest part of the State and 13 in Orange County in the southeastern part. The areas are described, and an analysis is made of the methods and costs of production and marketing, the returns, the factors affecting costs and returns, and labor income. A table shows the business-analysis factors in 1936 for the muck farms studied in Wayne County.

In Wayne County the farms with large acreages of celery had the lower costs per crate and per acre and higher returns for labor. Those with high yields had higher costs per acre but lower costs per crate. Large acreages and high yields combined gave the lowest costs and highest returns for labor. The average returns above all expenses per acre and per crate were $12 and 4 ct. for late celery in Wayne County, $448 and $1.14 for sash- or canvas-covered celery, and $108 and 28 ct. for early field-grown celery in Orange County. The average returns per hour for labor were 28 ct., 83 ct., and 55 ct., respectively.

Farm practices and management in central Pennsylvania, J. E. McCord (*Pennsylvania Sta. Bul. 379* (*1939*), *pp.* [2]+*101, figs. 15*).—This bulletin is based on 1,262 farm management records—from 123 to 281 per year—taken on Centre County farms and covering the years July 1, 1930, to June 30, 1937. The history, population, topography, climate, soils, transportation facilities, and markets of the area are described. An analysis is made of the capital, receipts, expenses, and profits; size of farm; crop acreages, yields, crop practices, and use of crops; number, value, purchases, and sales of livestock; the dairy, poultry, and swine enterprises; feeding practices; use of automobiles, trucks, and tractors; produce used in the home and farm home conveniences; factors affecting labor income; size of business; labor efficiency; capital turnover; and combination of enterprises on the farm.

The farms averaged approximately 160 acres, with 83.8 acres cropped. The average investment was $11,442 per farm, the average receipts $2,363, and the average expenses $1,641, leaving a farm income of $722 and a labor income of $150. Of the total receipts 59 percent was from livestock products, 18 percent from sale of crops, 15 percent from livestock increase, and 7 percent from miscellaneous sources. Products used as part of the family living were valued at $350 per year per farm. Retail milk marketing was the most profitable type of farming, with special crops second. The higher labor incomes were

made where (1) crop yields were 10 percent or more above the average, (2) 7,500 lb. of milk or more was sold per cow, (3) the production index was 20 percent above the average, (4) 300 or more days of productive work per year were put in, and (5) in the case of dairy farmers where more than 80 percent of the gross receipts were from livestock products. Farmers with less than $1,500 gross receipts per year rarely made a positive labor income, while those with $4,500 or more had positive incomes each year. Those with gross returns averaging 12 percent or less of the capital invested did not have plus labor incomes any year, while those with receipts of 24 percent or more of the average capital had plus labor incomes each year.

Farming possibilities in Horry County, South Carolina, O. STEANSON, M. H. SUTHERLAND, and M. C. ROCHESTER. (Coop. U. S. D. A.). (*South Carolina Sta. Bul. 318 (1939), pp. 72, figs. 2*).—The bulletin describes and discusses the factors affecting agriculture in the county; the past and present farm business organization—land utilization and cropping practices, crop yields, production factors and financial outcome of different crops, production operations and labor requirements, livestock enterprises, farm labor, capital investment, farm income, labor relationship, etc.; and the types of farm organization—family cotton, family tobacco, and large tobacco farms.

The wheat economy, G. E. BRITNELL ([*Toronto*]: *Univ. Toronto Press, 1939, pp. XVI+[1]+259, pls. 3, figs. 4*).—This volume deals with the prairie provinces of Canada, especially Saskatchewan. The geographical background, railways and population, the distributing structure, and provincial and municipal institutions are described. The agricultural settlement and expansion of the area, economic farm unit, land tenure, production trends, gross and net farm income, farm indebtedness, farm relief, farm standards of living, and rehabilitation of the area are discussed.

Quality of North Carolina cotton 1928–1936, W. B. LANHAM, G. R. SMITH, and R. H. RAPER. (Coop. U. S. D. A.). (*North Carolina Sta. Bul. 323 (1939), pp. 51, figs. 16*).—Samples were obtained for an average of 55 gins each year, representing 5 to 9 percent of the cotton produced in the State. An analysis for the 4 general grade and staple districts of the State and 12 subdistricts is made and compared with the United States as to staple length and grade. Prices and premiums and discounts on different grades and staple lengths and the consumption of cotton in the State are discussed.

During the period the average staple length of cotton produced in the State increased from 14.69 sixteenths of an inch to 16.07 sixteenths of an inch as compared with from 15.18 sixteenths of an inch to 15.77 sixteenths of an inch for the United States. In 1936 13 percent of the cotton in the State had a staple length of less than 15/16 in. and 85 percent 15/16 to 1 1/16 in. as compared with 80 percent and 19 percent, respectively, in 1928. Little or no progress was made in improving grades. The proportion of 7/8-in. cotton increased gradually to about January 15 then decreased, while that of 1-in. and longer cotton decreased to about January 15 and then increased. The percentage of 15/16-in. and shorter cotton remained almost constant throughout the season. The grade decreased rapidly as the season advanced. The production in the State ranged from 579,300 bales in 1935 to 869,300 in 1928, averaging 711,800 bales, and the consumption in the State from 1,249,700 bales in 1934 to 2,021,100 bales in 1936, averaging 1,467,700 bales. Prices to growers reflected only 18.8 percent of the central market premiums for grades above Middling and 59.1 percent of those for staple lengths longer than 7/8 in. Discounts for lower grades averaged 64.4 and 14.9 percent for shorter staples.

Idaho potato has strong competition (*Idaho Sta. Bul. 229 (1939), pp. 23, 4*).—Included are findings as to relative prices in Chicago, 1929–37, of Idaho Russet and Colorado Red McClure potatoes, the range of the price spreads, and the relative volumes of the two varieties marketed.

Joint correlation applied to the quality and price of McIntosh apples, J. R. RAEBURN (*[New York] Cornell Sta. Mem. 220 (1939), pp. 44, figs. 14*).—This study was made with a view to developing methods of partial joint (surface) curvilinear correlation. It is based on records of quality of and prices received for 98 lots of McIntosh apples sold to jobbers on the Washington Street market, 159 lots sold by jobbers on the Washington Street, Wallabout, and Harlem markets, and 47 lots sold by farmers on the Wallabout farmers' market of New York City from October 9 to November 28, 1934. The three groups are studied separately. Joint curvilinear correlations were made using price, average diameter, percentages of serious and not-serious defects, indexes of variation in diameter, facing for serious and not-serious defects, color and facing for color, grade and size marked, and size of container. The profitableness of strict grading for serious and not-serious defects and diameter, the actual market premiums for quality, and the standards set up by grading regulations are discussed.

Serious and not-serious defects affected prices jointly, the influence of each depending on the proportion of the other. Jobbers paid premiums for only a limited amount of quality with respect to defects. Retailers paid higher premiums for quality and discounted defective apples more than jobbers. On farmers' markets serious defects reduced prices about the same as on jobbers' markets, but not-serious defects were not important. Retailers paid less than jobbers for increase in average diameter from 2.6 to 2.8 in. when few defects were present and more when the defects were numerous. Where there were few defects retailers paid more for apples averaging 2.8 in. than those averaging 3 in. in diameter. Retailers discounted small diameters less when buying from farmers than when buying from jobbers. Large diameters were discounted more unless many defects were present. Proportion of serious and not-serious defects and average diameter accounted for 42.9 percent of the variation in the price of lots sold to jobbers and 56.9 in those sold by jobbers. Prices were adjusted to quality more closely in lots sold by jobbers to retailers than in those sold to jobbers by wholesalers. Facing for defects raised prices of the lots with many defects about the same on the wholesale market as on the jobbers' markets. Facing for not-serious defects raised prices more than for serious defects. Jobbers paid slightly more than retailers for extra color and facing for color. The prices paid by retailers for extra color and color facing were more for lots marked as high grade and large size. A small premium was paid for large "bushel" crates, but it was not in proportion to the larger volume. "If the premiums for quality paid by retailers had been received by the producer, it might have been profitable to reduce the proportion of not-serious defects from 30 to 10 percent when few serious defects were present, to reduce the proportion of serious defects to less than 10 percent when only 10 percent of not-serious defects were present, [and] to grade lots of small apples with many defects (index of defects 50 and average diameter 2.6) more closely on the basis of average diameter."

The author states that both the maximum and minimum size of apples should be marked on crates, the grading regulations should limit the proportion of not-serious defects permissible in the Utility grade, and that apples with less than 67 percent of the skin "a good red characteristic of the variety" should not be permitted in the United States Fancy grade, nor those with less than 33 percent in the United States No. 1 grade.

Wool and the wool trade, A. H. GARSIDE (*New York: Frederick A. Stokes Co., 1939, pp. XV+331, [pls. 23, figs. 3]*).—The apparel wool trade in the United States is discussed, particularly from the standpoint of the New York Wool Top Exchange. The first chapters, dealing with the size of the industry, production, scouring, shrinkage, grading, etc., cover both apparel and carpet wool.

Proceedings of the Conference on Markets for Western Farm Products (*Winnipeg: Govt., 1938, pp. 333, figs. 39*).—The following leading papers presented at the conference arranged by the Province of Manitoba and held at Winnipeg December 12–15, 1938, are included: Western Agriculture in the Canadian Economy, by W. A. Mackintosh (pp. 8–18); An Appraisal of the World Wheat Situation, by C. F. Wilson (pp. 18–60); An Appraisal of the Canadian Wheat Situation, by H. L. Griffin (pp. 60–81); European Wheat Requirements and Policies, by L. A. Wheeler (pp. 81–90), and The Wheat Problem of the United States, by R. M. Evans (pp. 90–95) (both U. S. D. A.); Export Markets for Canadian Flour, by C. H. G. Short (pp. 95–110); The Wheat Industry of Australia, by P. F. Bredt (pp. 110–114); The Wheat Industry of the Argentine, by D. A. MacGibbon (pp. 115–119); Monetary Policy in Relation to Farm Income, by A. R. Upgren (pp. 131–143) (Univ. Minn.); What the Price of Wheat Means to Western Farmers, by E. C. Hope (pp. 146–158); A Submission by the Calgary Board of Trade, by C. Pierce (pp. 158–161); Relationship of Value of Wheat Production to Business Submitted by Regina Board of Trade, by R. L. Christopherson (pp. 162–165); Western Agricultural Zones and Their Adaptability to Various Types of Farming, by J. H. Ellis, J. Mitchell, and F. A. Wyatt (pp. 165–173); The General Utilization of Land in Manitoba and the Agricultural Use Made of the Cultivated Lands, by J. H. Ellis (pp. 173–193); Saskatchewan Soil Zones, by J. Mitchell (pp. 194–196); Western Agricultural Zones and Their Adaptability to Various Types of Farming, by F. A. Wyatt (pp. 196–201); The Possibilities of Shifting From Wheat Growing to Other Types of Farming in Western Canada and the Implications of Such Changes, by J. B. Taggart (pp. 201–213); The Barley Industry of Western Canada, by A. T. Elders (pp. 213–234); The Honey Industry and Markets for Honey, by L. T. Floyd (pp. 246–249), E. Braun (pp. 249–252), and J. W. Braithwaite (pp. 252–257); Marketing Problems Facing the Fresh Water Fisheries in General and Those of Manitoba in Particular, by W. A. Found (pp. 257–265); The Problem of Export Markets for Canadian Cattle, by A. M. Shaw (pp. 265–275); The Problem of Export Markets for Canadian Hogs, by L. W. Pearsall (pp. 275–284); Markets for Creamery Butter, by G. W. Tovell (pp. 292–308); and The Western Poultry Industry and Its Marketing Problem, by W. A. Landreth (pp. 309–314).

Milk cartage in the Southwick-Agawam area of the Springfield milkshed, A. A. BROWN and J. E. DONLEY (*Massachusetts Sta. Bul. 363 (1939), pp. 26, figs. 11*).—This is a study made of 12 milk routes serving 112 producers and supplying 12 dealers in January 1935. Tables show for May and December 1935 for the 7 largest routes the size of loads, stops per load, total miles traveled, collection per miles traveled, pounds of milk per mile, and miles traveled per stop of total mileage and collection mileage. Other tables show the rates paid by producers and producers' cash costs of cartage on the 12 routes, the seasonal variations between May and December in income and load in the most variable and least variable groups, and other data. A reorganization of 12 of the original routes into 4 routes is outlined.

Under the original routes the average size of load ranged from 344 to 3,064 lb., the number of producers per load from 2 to 28, and the rates (11 rates) from 20 to over 46½ ct. per 100 lb., the most common rate being 35 ct. Under a suggested plan the total route mileage is reduced from 270 to 167 miles, the actual collection mileage from 142 to 98 miles, and deadheading from 128 to 69 miles, and the

average per 100 lb. cost from 33.4 ct. to 24.2 ct. Five rate zones with rates per 100 lb. of 15 to 35 ct., with an additional 5 ct. for off-route producers, are suggested. The most common rate under this plan is 20 to 25 ct. It is estimated that the lower cartage rates would save producers an average of $26 per year.

Organizing a farmers' cooperative, S. D. SANDERS (*Farm Credit Admin. [U. S.], Coop. Div., Cir. C-108 (1938), pp. I+42, fig. 1*).—This popular circular gives information and suggestions regarding the various steps in the organization of a cooperative association. Suggested organization forms and the Capper-Volstead Act are included in appendixes.

Financial history of Ohio farmer owned elevators for the period 1928–1938, B. A. WALLACE (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 120 (1939), pp. [2]+28, figs. 2*).—This is a continuation of the series (E. S. R., 78, p. 870).

Operations of cooperative grain elevators in Kansas and Oklahoma, H. HEDGES. (Coop. Kans. State Col. and Okla. A. and M. Col.). (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 30 (1939), pp. IV+64, figs. 20*).—The objectives of this study were to determine the financial status of the cooperative grain elevators in Kansas and Oklahoma, to obtain information on their operating practices and problems, to learn more of the factors influencing income and business success, and to provide definite conclusions regarding operation and membership. Data were assembled for the crop years 1931–32 to 1935–36 annually, chiefly from annual reports of the associations, in regard to financial status, operating practices, and results of a large number of farmers' grain elevators in two States, and for the crop year 1936–37 from a survey by the Farm Credit Administration of all farmers' cooperative associations in the United States. The importance of local cooperative grain marketing, financial status, operating results and the factors influencing such results, membership and membership patronage and their relations to business volume, capital structure and net income, grain volume and side lines as operating factors, and unit costs of operations are discussed.

Accounting procedure for cooperative grain elevators, E. B. BALLOW (*Farm Credit Admin. [U. S.], Div. Res., Bul. 28 (1938), pp. IV+221*).—A method of bookkeeping procedure for operating accounting systems is set forth in detail. It deals largely with a classification of accounts needed and a definition of the items that may be assigned as debits and credits.

A manual of farm law, N. H. MOLLER (*London: Stevens & Sons and Sweet & Maxwell, 1938, pp. XLIV+528*).—Legal material covering the activities of farmers in England is brought together.

[Farm management and appraisal of rural property] (*Jour. Amer. Soc. Farm Mgrs. and Rural Appraisers, 2 (1938), Nos. 1, pp. 3–38, 56, figs. 3; 2, pp. 59–84, figs. 2*).—Included are articles as follows:

No. 1.—The English System of Regulating Landlord-Tenant Relations, by K. Brandt (pp. 3–14); The Past Performance of Two Price Averages, by E. E. McAnelly (pp. 15–19); Perpendicular Diversification, by D. H. Doane (pp. 20–23); How Much Credit Is Too Much Debt for the Farmer? by R. M. Green (pp. 24–26) (U. S. D. A.); Farm Accounting From the Viewpoint of the Farm Manager, by M. M. Winkler (pp. 27–29); Verification of Income and Expense Items, by E. J. McConnell (pp. 30–35); and Factors Influencing Farm Lending Experience in Coles and the Six Adjoining Counties, Illinois, 1917–1933, by J. Ackerman (pp. 36–38) (Univ. Ill.).

No. 2.—Debt-Carrying Capacity of Farm Property in Relation to Cash Income, by W. H. Pine (pp. 59–63) (Kans. State Col.); The Co-ordination of Farm Management with Servicing of Farms and Loans, by F. W. Reinoehl (pp.

64–72); **Establishing the Income Capitalization Value, by E. R. Morrison** (pp. 73–76); Comparative Adjustments in the American Rural Appraisal System, by H. E. Stalcup (pp. 77–80); and Soil Texture and the Appraiser, by H. Pike (pp. 81–84) (Iowa State Col.).

Farm mortgage loan experience in central Montana: A study of the important factors associated with good or bad mortgage loan experience, P. S. ECKERT and O. H. MAUGHAN (*Montana Sta. Bul. 372 (1939), pp. 39, figs. 14*).—This study of factors associated with mortgage loan experience is based on an analysis of the loans on 529 farms made prior to 1933 in Fergus and Judith Basin Counties, and a sample area comprising parts of Cascade, Chouteau, Liberty, Pondera, Teton, and Toole Counties. General information about the area is included.

Seventy percent of the loans made from 1911–20 and 41 percent of those made from 1911–33 had been foreclosed by the end of 1937. Twenty-one percent of the loans on livestock ranches and 44 percent of those on wheat farms had been foreclosed, the losses per $100 loaned being $5.22 and $14.89, respectively. The percentages of foreclosures as affected by different factors were: 22 percent on first-class farm land and 58 percent on fourth-class land; 8 percent on farms with wheat yields averaging 20 bu. or more per acre and 61 percent on those with yields of less than 5 bu.; 8 percent on farms classed as excellent on the basis of size and condition of buildings and other visible evidence as to amount and condition of farm capital as compared with 87 percent on farms where improvements were negligible; 16 percent on wheat farms over 1,000 acres or more cultivated and 59 percent where there were less than 200 cultivated acres; 10 percent on wheat farms with $10,000 to $20,000 productivity value and 63 percent where the productivity value was less than $1,000; 30 percent where loans were less than 20 percent of the appraised value and 44 percent where they were over 45 percent of the appraised value; 34 percent where the taxes were less than 3 percent of the productivity value and 52 percent where they were 9 percent or over; less than 18 percent on farms using electricity or telephone as compared with 40 percent without such services; 26 percent on loans of less than $5 per acre of total acreage, 42 percent for loans of $5 to $10 per acre, and 49 percent for loans of $20 or more per acre; and 12 percent where loans were less than $10 per cultivated acre and 49 percent where they were $25 or more.

The sixth annual report of the Farm Credit Administration, 1938 (*Farm Credit Admin. [U. S.] Ann. Rpt., 6 (1938), pp. [VI]+238, figs. 19*).—This is the report submitted to the House of Representatives. It covers the Federal land banks, the National farm loan associations, production credit corporations and associations, Federal intermediate banks, Land Bank Commissioner loans, emergency crop and feed loan offices, Agricultural Credit Corporation stock purchase loans, joint stock land banks, etc., and the operations of the several divisions of the Administration.

Foreign Agriculture, [June 1939] (*U. S. Dept. Agr., Foreign Agr. Serv., Foreign Agr., 3 (1939), No. 6, pp. 219–278, figs. 10*).—Included are articles on The Market for American Tobacco in the Netherlands, by P. G. Minneman (pp. 221–262), and Recent Japanese Agricultural Policies, by O. L. Dawson and W. Ladejinsky (pp. 263–274), and notes on recent developments in foreign agricultural policy as follows: Peruvian Institute of Agricultural Studies, Egypt enacts law for the reduction of mortgage debts, and Swiss-Rumanian wheat purchase agreement.

The Netherlands state policy of price regulation with regard to the products of animal husbandry since 1932 [trans. title], E. VON OERTZEN

(*Ber. Landw. Reichsmin. Ernähr. u. Landw.* [*Germany*], *n. ser.*, *24* (*1939*), *No. 1*, *pp. 49–120; Eng., Fr., Ital., Span. abs., pp. 114–118*).—The policy of the government and the results obtained are discussed.

Prices of farms in Finland in 1933–1938 [trans. title], L. Sipilä (*Acta Agr. Fenn., No. 40* (*1939*), *pp.* [*1*]+*87, figs. 22; Eng. abs., pp. 84–86*).—This study is based on 3,510 forced sales 1933–36 and 339 voluntary sales 1935–38. Auction prices fell during the period 1933–36, while the index of voluntary sales prices rose from 100 in 1935 to 116, 134, and 143, respectively, in the following 3 yr.

***Crops and Markets,* [*May–June 1939*]** (*U. S. Dept. Agr., Crops and Markets, 16* (*1939*), *Nos. 5, pp. 89–104, fig. 1; 6, pp. 105–124, figs. 2*).—Included are crop and market reports of the usual types.

Ohio agricultural statistics, 1937, G. S. Ray, O. M. Frost, and P. P. Wallrabenstein. (Coop. U. S. D. A.). (*Ohio Sta. Bul. 602* (*1939*), *pp. 59, fig. 1*).—This bulletin continues the series (E. S. R., 79, p. 703).

***Preliminary report:* Statistical analysis of the annual average f. o. b. prices of California canned asparagus, 1925–26 to 1938–39,** H. R. Wellman (*California Sta., 1939, pp.* [*1*]+*6, figs. 2*).—Tables and charts are included showing the relations of shipments, indexes of nonagricultural income in the United States, and indexes of income of industrial workers to the f. o. b. prices of California canned asparagus.

Statistical analysis of the annual average f. o. b. prices of canned clingstone peaches, 1924–25 to 1938–39, H. R. Wellman (*California Sta. Mimeog. Rpt. 67* (*1939*), *pp.* [*1*]+*9, figs. 3*).—For the 15-yr. period a change of 1,000,000 cases in total shipments was accompanied by a change of 16 ct. in the opposite direction in the f. o. b. price, a change of 10 points in the index of nonagricultural income in the United States by a change of 48 ct. per case in the same direction, and a change of 10 points in the adjusted index of prices of competing canned fruits by a change of 25 ct. per case in the same direction.

Oils and fats: Production and international trade, A. Brizi (*Internatl. Inst. Agr.* [*Roma*], *Studies Princ. Agr. Prod. World Market, Nos. 4* (*1939*), *pt. 1, pp.* [*13*]+*345, figs. 6; 5, pt. 2, pp.* [*5*]+*423, pls. 14*).—Continuing this series (E. S. R., 81, p. 444), the production and international trade in oils and fats and the trends therein are described by product and countries. Part 1 deals with vegetable oils and fats and part 2 with those from land and marine animals, including sections on the production and consumption of fats and oils in certain countries and the utilization and prices of oils and fats. Part 1 was edited by I. Grinenco and part 2 by H. Böker (except for the section on fats from land animals, which was prepared by S. Taussig).

RURAL SOCIOLOGY

Rural social-economic planning (*Plan Age, 4* (*1938*), *No. 6, pp. 149–184*).—Papers presented were: The Social Elements in Land Planning, by C. C. Taylor (pp. 149–155); Institutional Adjustments in Land Planning, by W. E. Packard (pp. 156–162); Positive Agricultural Planning, by A. W. Stuart (pp. 163–169); Coordinating Land-Use Programs, by M. S. Eisenhower (pp. 170–176); and Credit as a Factor in Land Planning, by D. R. Rush (pp. 177–184).

A preliminary group classification based on structure, D. Sanderson. (Cornell Univ.). (*Social Forces, 17* (*1938*), *No. 2, pp. 196–201*).—The leader presents and explains a tentative classification for groups based on structure.

The number of unincorporated places in the United States and their estimated populations, P. H. Landis (*Wash. State Col. Res. Studies, 6* (*1938*), *No. 4, pp. 160–188*).—The number of places with 0 to 2,499 population reported

by Bradstreet for the United States reached its climax in 1910 when there were 75,436 places. During the following decade the number decreased 12,668, and during the decade 1920-30 it dropped 6,193. In 1900, 73,882 places were listed; in 1930 there were only 56,575.

Composition and characteristics of the agricultural population in California, G. M. PETERSON (*California Sta. Bul. 630 (1939), pp. 48*).—Of the 135,676 farms listed in the 1930 census of agriculture for California, 10,877 were occupied urban farms, 106,335 occupied rural farms, and 18,464 operated by people who did not live on the farms.

Of the farmer operators 42,511, or nearly one-third of the total, reported that they had worked off the farms in 1929, and 21,929 of them reported that they spent more than 150 days each working off the farm. If 275 days represents full-time employment, then the work off the farm by all farm operators is equivalent to about 25,000 full-time workers. These may be roughly divided into 7,000 working in agriculture and 18,000 working in other industries than agriculture.

In 1929 the largest farms in the State, representing only 2.1 percent of the total number of farms, had 34.6 percent of the total expenditure for hired labor. Farming operations and the activities of people living on farms are becoming so intermingled with other industries and occupations that it is no longer possible to treat agriculture or people living on farms as isolated separate entities. Agricultural policy in the future must consider these complications. Of all the gainfully employed males in California, only 16.5 percent are gainfully employed in agriculture, which as a source of gainful employment is not so important as either trade or manufacturing. Farmers as owners and tenants represent only 6.2 percent of all of the gainfully employed males in the State, whereas persons employed on farms as laborers, managers, and foremen represent 10.3 percent.

There are almost as many native white farm laborers as there are native white farm operators. Native and foreign-born whites constitute 59.5 percent of the farm laborers, Mexicans 20.9, Japanese 7.4, and Filipinos 8.2 percent. The corresponding percentages for farm managers and foremen were for native and foreign-born whites 74.1 percent, Mexicans 3.4, Japanese 19.1, and Filipinos 1.1 percent. Since there are very few Filipino women in the State, Filipinos as a race group in California will decrease in importance. The opposite conditions apply to Japanese and Mexicans, of whom about one-half of the total represented by each race in 1930 were native-born citizens of California. Families of these races with homemakers average 5.12 persons each as compared with 3.7 for white families.

Farm population mobility in selected Montana communities, C. F. KRAENZEL (*Montana Sta. Bul. 371 (1939), pp. 64, figs. 15*).—This study shows that drought period migration conforms to the usual mobility patterns, except that it affects more people. Usual mobility aspects that also characterize drought period migration are the following: (1) Short distance mobility is more frequent than long distance mobility, (2) an exodus out of an area is always accompanied by a countermovement of population into the same area, (3) the older families and population are less migratory than the younger families and population, (4) proportionately more males than females enter the rural areas, and (5) long distance migrants tend to go more frequently to urban than to rural areas and enter urban and industrial occupations more frequently than they enter rural and agricultural occupations. The exodus of some population, in many drought areas, is not likely to be a solution to the existing problems of pressure of population on resources, because the recent

settlement and the similarity of age of the settlers means that the sons and daughters of the first agricultural settlers are only now ready to start farming for themselves. Great Plains communities create an opportunity for the second generation of beginning families to establish themselves in their home communities or nearby. The unusually high past mobility in many Great Plains areas has resulted in little attention being given to the "community" in the lives of people. Only one-third of the families ever resident in the areas of study had lived there for a period of 12 yr. It is believed that in order to achieve a more stable population it is necessary to have a well-established community.

Basic trends of social change in South Dakota.—I, Population tendencies, W. F. KUMLIEN (*South Dakota Sta. Bul. 327 (1939), pp. 58, figs. 58*).—South Dakota will have had statehood 50 yr. on November 2, 1939. The total population of the State increased consistently with each decade from 1870 to 1930, but has declined over 20,000 since the later date. The rate in increase declined sharply after 1910. American-born whites, living in the State in 1930, constituted 90.5 percent of the total white population, and 56.5 percent are South Dakota born. In 1890, 15 percent of the State's population was under 5 yr. of age, while only 2.4 percent was 65 or over. By 1930 those under 5 yr. of age had declined to 10.3 percent, while those 65 or over had increased to 5.4 percent. The middle group between 20 and 64 have remained fairly constant during the 50-yr. period.

South Dakota has since 1925 shown a tendency towards a definitely declining crude birth rate, and since 1933 a slightly increasing crude death rate. These trends, together with a virtual cessation of foreign immigrants, and a net loss in native migrants in and out of the State, have resulted in a decline in population first recorded in the State census of 1935. There are strong indications that because of the combination of limiting factors mentioned above which are operating in population growth, South Dakota will soon reach a stationary level.

Social conditions in the delta area, Utah, J. A. GEDDES, C. D. FREDRICKSON, and E. C. BERGESON (*Utah Sta. Bul. 288 (1939), pp. 93, figs. 16*).—The average size of family in the delta area was 4.67; on the poorest or class 3 soils it was 4.95. The State average was 4.19.

The ratio of males : females in the area was 120.46 : 100. In Utah (1930) it was 111.5. The Utah rural farm ratio was 114 : 100. In the delta area there was little excess of males up to 18 yr. of age. From this age on the number of daughters living at home declined much more rapidly than that of sons.

Families living in the area over 20 yr. had farms on the better soils. Proportionately more of the newcomers (those with less than 5 yr. residence) lived on the poor soils. More than two-thirds (67.2 percent) of the cooperator families were farmers at earlier periods of their lives. Laborers constituted 4.8 percent, semiskilled 4, skilled 8.8, business 5.6, and all other occupations 9.6 percent. The annual income and largest worth were greater after coming to the area than earlier, although the farms were smaller. The average education of fathers was 8.5 grades and mothers 9.5 grades.

The total expenditures for family living averaged $1,421 in the delta area in 1931. After the age of 12, sons spent more for clothing than their fathers, reaching a maximum of nearly twice the fathers' expenditure for the age group 19–24. Daughters over 12 also spent more than their mothers. The husband spent more for clothing than his wife by a margin of 100 to 88. The operation of the automobile cost the average family $83.26 per year. Eight out of 9 families owned automobiles.

Taxes were paid on 16.6 percent of the land belonging to cooperators. Of the total amount of taxes levied, 20.3 percent was collected (1931). There were no tax levies for health, economic development, or recreation, but small voluntary contributions were made in these fields. The church received the most support both in money and in number of families contributing to voluntary agencies, with an average of $40.02 to the family.

Few of the 742 area homes reached the minimum requirements set up for adequacy. Nonfarm homes, largely in the villages, met these requirements better than farm homes. The average original cost of the home for the delta area was $1,638 (1934). The assessor's valuation was $998. Delta area houses were small, with an average of 4.44 rooms to the house and 0.92 room to the person. The Delta area was lower than certain other Utah villages with respect to percentage of homes with electric lights, iron, and washer. It was also low in running water, kitchen sink, stationary bath, and indoor toilet. Less than two-thirds (60.8 percent) of the homes of the area had electric lights, less than one-third running water, less than one-fourth running hot and cold water, and slightly more than a fifth a bathtub and an indoor toilet. Only 1 home in 15 was centrally heated. Very few refrigerators or electric stoves were found. Less than one-fourth of the homes were in good repair. Over one-half (59.2 percent) of the homes had radios (1934), and in 1935 48 percent of the homes in Millard County were so equipped. Only 1 home in 6 had a telephone (1934). A daily newspaper was taken in a little over one-half of the homes and a weekly paper in a little over a fourth. The more remote areas had the highest percentage owning a car.

Most of the delta area population were Utah born. One-fourth of the farmers and one-third of the homemakers were born in Millard County. One out of 10 lived within 10 miles of his birthplace, while two-thirds were within 250 miles of it.

Those who had always lived in the area had been economically more successful in both good times and bad than had those who had moved into it.

Pioneer social adaptation in the Palouse country of eastern Washington, 1870–90, F. R. Yoder (*Wash. State Col. Res. Studies, 6 (1938), No. 4, pp. 131–159*).—This article is based on personal interviews with 50 pioneer men and women living in all parts of the Palouse country of eastern Washington, made in 1936, 1937, and 1938. The author found that pioneer families have adapted themselves basically to the conditions prevailing in the Palouse country.

A study of Virginia's rural marginal population, A. D. Edwards. (Va. Expt. Sta.). (*Social Forces, 17 (1939), No. 3, pp. 385–395*).—The author states that a large proportion of the rural white and Negro population exists on a bare subsistence plane of living economically and culturally. Areas with a high rate of marginality have high indices of fertility. Data indicate that differential fertility among socioeconomic groups is rather marked in Virginia. Vertical social mobility is not proceeding rapidly. The low level of achievement of marginal people can be explained entirely from a cultural point of view. The author concludes that there is need for bold experimentation in practical means of bringing about an improvement in the condition of marginal folk.

Arizona's farm laborers, E. D. Tetreau (*Arizona Sta. Bul. 163 (1939), pp. 293–336, figs. 4*).—This study, made as of April 1936 and including 1,500 farm laborers' households located in the Upper Gila, Salt River, Yuma-Gila, and Casa Grande Valleys, deals with the composition and character of Arizona farm laborer population, its location, and its adequacy. More than one-half of the

heads of laborers' households were of Mexican origin born in the State of Sonora or in southern Arizona. Another third of them were from the Cotton Belt, from other States, or native to Arizona, and the remainder were Yaqui Indians, Negroes, or Orientals. The greater part of all farm laborers' households made no change in residence during a sample period of 15 mo. Similarly, a very large part of the heads of laborers' households made no change in occupation. More living children were reported by Mexican mothers of completed families than by mothers in other racial and nativity groups. Though smaller than Mexican families, the size of completed families among native white and other laborers was sufficient to provide replacements for older laborers and a surplus population for other than agricultural industries. Since almost 70 percent of the heads of households who were farm laborers were under 45 yr. of age as compared with 50 percent of the tenants and 36 percent of the farm owners and managers, it was evident that farm laborers as a class were in the most vigorous years as compared with other agricultural classes. Farm laborers' households were located in the open country in the proportion of two of every three households.

Arizona's resident farm labor supply was found to be numerically adequate for the hired labor requirements of Arizona's irrigated farms during the seasons from January through April and from May through August 1937. Many farm laborers were without steady employment during the January–April season. January requirements were sufficient to regularly employ about three-fourths of the resident laborers, leaving out of consideration the out-of-State laborers who came to pick cotton. By March the requirements had fallen to a low mark for the year, only three of every five resident laborers being regularly needed as hired laborers. During the middle of the May–August season, farm laborers were practically all needed to meet farm requirements, but later there was a falling off in demand so that more than one-fourth of them were not needed during August.

From September through December all resident laborers on farms and in rural towns were required and many more were drawn from other sources. Early in the season extra laborers were drawn from Indian reservations, larger towns and cities in Arizona, and from other States, and these numbered more than one-half as many as the total resident supply in rural towns and on farms in irrigated areas. Numbers of workers increased through October into November as the cotton picking season advanced, until a peak supply of 45,600 hired laborers was reached, 20,000 of whom had come from outside the State.

Rural youth in farm organization and other national agency programs (*Washington, D. C.: Amer. Youth Comn., 1939, pp. [4]+82*).—This report consists of two parts, older youth activity in leading farm organizations, by E. L. Kirkpatrick and A. M. Boynton, and older young people's part in civic and character-building organizations, by M. M. Chambers and E. L. Kirkpatrick. They are designed to inform the general reader of the multiplicity of organizations reaching into rural fields.

Rural youth speak, J. J. LISTER and E. L. KIRKPATRICK (*Washington, D. C.: Amer. Youth Comn., 1939, pp. [5]+96, pls. 2, figs. 7*).—This is a detailed analysis of the replies from rural young people interviewed in a comprehensive survey by the American Youth Commission.

The demographic basis of old age assistance in the South, T. L. SMITH. (La. State Univ.). (*Social Forces, 17 (1939), No. 3, pp. 356–361, figs. 4*).—The author indicates that while the proportion of aged persons in the population has assumed great social significance in the Nation as a whole, the proportion of the aged in the South is low and youth is superabundant.

Interests of rural people as portrayed in weekly newspapers, C. R. Hoffer (*Michigan Sta. Spec. Bul. 298 (1939), pp. 30, figs. 3*).—This study shows that interests pertaining to the personal affairs and relationships of residents in rural communities are the dominant ones, and this constitutes a basic principle in rural community development. The neighborhood and similar social groups are important in contemporary life, notwithstanding the great increase in the influence of the larger secondary groups. General news occupied only 12 percent of the total news content of the 35 Michigan weeklies studied, and news items about State affairs 8.2 percent. The rest consisted of local and county news. The distribution of percentages among the different subjects in local news indicated the readiness of response residents in rural communities will be likely to make to programs of community improvement. Following neighborhood and personal news, other topics appeared in the order agriculture, school, church, civic and patriotic affairs, announcements, political affairs, recreation, adult education, business, and health. "The ranking of these subjects on the basis of percentages derived in the study constitutes a norm to which reference may be made when plans in community development are contemplated."

The analysis of editorials shows that the rural weekly papers contributed to the development of interests pertaining to local community affairs by directing the attention of readers to matters which might otherwise be overlooked, or by interpreting events which related to the community. "The more abstract values were considered, and in this respect the local paper performed a role similar to that of the church, the school, or public forum in the development of interests relating to the community."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

American farming: Agriculture I, A. Boss, H. K. Wilson, and W. E. Petersen (*Saint Paul, Minn.: Webb Book Pub. Co., 1939, pp. XIV+526, figs. [231]*).—This is the first of four books for use in studying agriculture. It is designed especially to serve the needs of junior high school students in gaining knowledge of agriculture as a mode of life. The several chapters deal with American agriculture, agricultural production areas and the economic forces modifying them, types of farming, farming as a vocation, starting a farm business, needs of man and how they are fulfilled, soil, growth of plants, grain, meadow and pasture crops, legumes, root and tuber crops, sugar plants, fiber crops, gardening, fruit growing, forestry, enemies of plants, beautifying the home grounds, livestock farming, dairying, the production of different kinds of livestock, feeding livestock, and vocational guidance in agriculture.

Observations on American dairy husbandry, A. S. Foot (*[Gt. Brit.] Col. Estate Mangt., Rpts. Col. Trav. Scholars Agr., No. 5 (1937), pp. VII+151, figs. 33*).—The sections of this report on a traveling scholarship in agriculture describe and discuss the normal milk production on typical farms, current methods of improvement of commercial dairy cattle, feeding, control of quality of milk, and dairy husbandry research in the United States and Canada.

Agricultural engineering in North America and Germany, C. Culpin (*[Gt. Brit.] Col. Estate Mangt., Rpts. Col. Trav. Scholars Agr., No. 6 (1939), pp. XII+162, figs. 43*).—The sections of this report of a traveling scholarship in agriculture describe and discuss the scope and accomplishment of agricultural engineering in the United States and Germany, the organization of the research and educational services, and the recent developments in the two countries.

Forest conservation in the social studies, W. P. Beard (*U. S. Dept. Agr., Forest Serv., 1938, pp. [4]+V+147, pls. 5*).—This is a series of seven units

proposed for the use of high school social-studies teachers and course-of-study committees.

Short-time camps: A manual for 4-H leaders, E. GARDNER (*U. S. Dept. Agr., Misc. Pub. 346 (1939), pp. IV+90, figs. 12*).—This manual for 4-H club leaders includes sections on types of camps, standards for facilities and their use, business management, camp organization and conduct, the camp program, and program content. An appendix includes descriptions of camp ceremonies by I. T. Bode and others, examples of report blanks, topics for group discussion, list of program events used in 4-H camps, and a bibliography.

FOODS—HUMAN NUTRITION

Food and welfare, F. L. MCDOUGALL (*Geneva Studies, 9 (1938), No. 5, pp. 56*).—In this brochure the author has attempted to interpret in terms of "consumer economics" the activities of the League of Nations through its economic and financial organization concerning nutrition and the standards of living as noted in published reports and from unfinished inquiries. The bases of the problems of nutrition are outlined, with the general dietary recommendations of the Technical Commission on Nutrition. Trends in food consumption in various countries are discussed, with the conclusion that "the problem of nutrition can best be stated as a problem of underconsumption of food, for the most part qualitative underconsumption, that is, underconsumption of the protective foods, but also in certain sections of the populations quantitative underconsumption of food, which amounts to incipient starvation. Further, this underconsumption of food, which has such disastrous effects in impairing health and reducing efficiency, is mainly attributable to the inadequacy of the available income for purchasing a sufficiency of both energy and protective foods." This aspect of the nutrition problem, economics of food consumption, is next reviewed, with the suggestion that there are "three theoretical means of effecting an improvement in nutrition through facilitating consumption of protective foods, firstly, through raising the lower levels of income, secondly, through a reduction in prices of the basic energy foods, thereby leaving more income available for the purchase of protective foods, and thirdly, through a reduction in prices of the protective foods. A lowering of prices of protective foods alone will not, however, greatly benefit people who have very little money to spare for buying such foods. It is clear that what is required is a general raising of the standard of living, for improved nutrition is only one aspect of an improved level of life embracing food, housing, clothing, education, and cultural activities."

Standards of living are then discussed, with the statement that "unemployment benefits, grants for large families, provision of free meals to school children, supplies of milk to pregnant and nursing women and to children are all excellent and necessary measures for the immediate relief of poverty," but that "it is not through such measures that the fundamental problems of underconsumption will be solved. There must be general constructive policies of economic betterment which shall aim at stimulating enterprise in all directions." The most promising means toward progressive betterment of living standards is thought to be through the governments intensifying their efforts toward increasing efficiency and thus reducing costs in both production and distribution. This line of advance in agriculture is considered in a chapter dealing with the agricultural problems, which, together with a final chapter on some results of policies of increased consumption, emphasizes the importance of national and international nutrition policies for the purpose of relating increased production to nutritional needs.

It is emphasized in conclusion that "the improvement in standards of living by policies designed to supply the consumer with cheaper energy foods and larger supplies of protective foods might have two outstanding results in the general economic field, namely, (1) a beneficial stimulus to world trade through the opening up of farm markets for manufactured goods, and (2) an alleviation of the effects of trade depressions."

Health needs of the Nation, T. PARRAN (*Pub. Health Rpts. [U. S.], 54 (1939), No. 22, pp. 919–924*).—In this address, delivered at the 1939 Red Cross Convention, the author discusses the evidence of "malnutrition prevalent in a land of plenty," and states his belief that in the field of better nutrition "a broadly conceived, dynamically executed policy under the aegis of the American Red Cross might transform our whole national status." The job is considered to be threefold. "It means re-education of millions in the use of foods. It means the machinery for getting food into empty hands, and finally, it means a vast multiplication and improvement of all present effort to grow gardens where there are none, to make sure that every child has the needed quart of clean milk a day, and to use every possible device that will encourage the individual to enrich his own diet by the means ready at his hand."

Report on nutrition (*Paddington, Eng.: Brit. Assoc. Labour Leg., pp. 118, figs. 3*).—This report has been prepared by a committee of the British Association for Labor Legislation to acquaint the layman with the newer knowledge of nutrition, nutrition problems as they exist in Great Britain, and some of the measures being taken to cope with existing malnutrition and undernutrition, and to suggest certain changes in policies to meet consumption needs. Of particular interest are the chapters dealing with the feeding of school children in England and Wales; the relation of British agriculture to national nutrition and systems of farming and national health; and the status of milk consumption in rural areas, the consumer demand for milk, and the quality of the supply.

Nutrition and physical training, C. F. WHITE (*Jour. Roy. Inst. Pub. Health and Hyg., 2 (1939), No. 6, pp. 374–380*).—In this presidential address to the nutrition and physical training section of the 1939 Congress of the Royal Institute of Public Health and Hygiene, Great Britain, the main steps in a national nutrition policy are enumerated as follows:

"(1) The ascertainment of the minimum food requirements for adequate nutrition at all ages and under all conditions of life as regards work and climate and taking into consideration social and religious customs and the relative availability of various types of food. (2) The ascertainment of the nature and extent of nutritional deficiencies. (3) The education of the public as to what constitute the essentials of an adequate diet and as to how such essentials should be purchased and prepared for consumption, and thus the creation of a demand for such essential foods. (4) The taking of the necessary steps to insure that such a demand can be met at prices which are within the means of the consumer and which at the same time afford a reasonable margin of profit to the producer."

Each of these steps is considered in some detail from the administrative point of view. "The problem of malnutrition is world-wide and its economic solution can only be found in an international nutrition policy."

Malnutrition: A challenge and an opportunity, F. G. BOUDREAU and H. D. KRUSE (*Amer. Jour. Pub. Health, 29 (1939), No. 5, pp. 427–433*).—In this paper, read at a joint session of the child hygiene and food and nutrition sections of the American Public Health Association at its 1938 annual meeting, the authors point out the lag between the advances in the science of nutrition during the last 25 yr. and their application by health and school authorities in detecting

malnutrition and promoting good nutrition. "Social agencies other than the health and school authorities have recognized the importance of a more precise knowledge of the problem and have attempted to apply to it the newer methods developed in the laboratories of biochemistry and physiology. The result is that we do not look to health agencies for advice and help on nutrition problems but to home economists and dietitians, the agricultural schools and land-grant colleges and universities."

Methods now in use or available for appraising nutritional status are discussed, existing evidence of malnutrition in the United States is reviewed, and a brief description is given of the plans for a comprehensive study on a cooperative basis by the departments of preventive medicine and pediatrics of Cornell University, the U. S. Public Health Service, the New York City Department of Health, and the Milbank Memorial Fund. This study includes medical and dietary histories of a large group of children, with extensive physical, physiological, biochemical, and clinical tests, the purpose being to select from the many tests and methods followed certain ones to be recommended for routine use in appraising nutritional status.

The food consumption of one hundred four families in Paco District, Manila, M. GUTIERREZ and F. O. SANTOS (*Philippine Jour. Sci., 66 (1938), No. 4, pp. 397–416*).—This report is based on records, including weight as purchased and cost, of the food materials consumed in the three principal meals of each family for 1 day and other pertinent data relating to the families, which were from the working class of one district in Manila. The number in the families ranged from 2 to 12, with an average of 6. More than 50 percent owned their houses but few the land on which they were built. Only 6 percent of the families were illiterate. The analyses of the foods were based on composition data previously reported (E. S. R., 67, p. 337) or made for the present study. The calculated values for calories, proteins, fats, carbohydrates, and minerals were reduced to adult male units by means of the Lusk coefficients.

The average daily intakes per adult male unit were $2,107 \pm 40.87$ calories, 63 ± 1.35 gm. proteins, 33 ± 1.48 fats, 377 ± 7.01 carbohydrates, and 11 ± 0.4 gm. minerals. Carbohydrates furnished 88 percent of the calories and proteins 12 percent, with 45 percent of the total from animal sources, chiefly fish. The most variable factor in the diet was fat and the least carbohydrate. It is estimated that the vitamin B_1 intake probably allowed little margin of safety.

A comparison of these data with the results of similar studies of rural families in the Philippines showed that the urban diets furnished less energy, carbohydrates, and minerals but significantly more fats and a better quality of protein. The food cost per adult male unit decreased with increase in the size of the household. With increased income the proportion spent for carbohydrates decreased and that for meat, fish, and eggs increased. Very little was spent for milk and dairy products. Approximately 80 percent of the families spent about 50 percent of their income for food. This was reflected in the superiority of the diets of the families with the higher incomes.

Adequate low-cost family dietaries, E. C. G. WILSON (*New Zeal. Jour. Sci. and Technol., 20 (1938), No. 3B, pp. 144B–160B, fig. 1*).—A series of weekly low-cost dietaries, based on the recommendations of the Technical Commission on Nutrition of the League of Nations (E. S. R., 75, p. 133), but adapted particularly to New Zealand food habits, is presented and discussed from the standpoint of certain changes in foodstuffs necessitated by local conditions, methods of computing prices, actual tests of the dietaries, certain disadvantages in them, and suggestions for further reduction of cost. The paper is of

particular value in showing that a considerable degree of flexibility in food selection to meet traditional food habits and local conditions is possible while still adhering in general to the recommended allowances of certain types of food.

Foods and nutrition [at the Hawaii Station] (*Hawaii Sta. Rpt. 1938, pp. 85–91, fig. 1*).—Included in this progress report (E. S. R., 79, p. 560) are summaries of studies by C. D. Miller on the response of young rats to graded doses of crystalline vitamin B_1 and on the content of various vitamins in whole fresh opihi, the Hawaiian limpet; by M. Potgieter on the utilization of calcium in taro by human subjects and by rats; by Potgieter, [T.] Takase, and L. Louis on the food consumption and family incomes and expenditures of 12 Japanese families near Honolulu; and by C. J. Hamre on the influence of splenectomy on the recovery from nutritional anemia in rats and on postnatal changes in the blood and blood-forming organs in rats from the breeding colony on adequate diet, as determined by analyses at various intervals from birth to 100 days of age.

Comparative digestibility of some soft curd milks in vitro, F. J. Doan and C. C. Flora (*Pennsylvania Sta. Bul. 380 (1939), pp. 30, figs. 13*).—The primary object of this investigation was to determine the accuracy of curd tension measurements as an index of the relative digestibility of various types of soft-curd milk. The method followed consisted of simultaneous determinations of the digestibility in vitro of samples of the milk by a method based on the one developed by Doan and Welch (E. S. R., 73, p. 231) and Lear and Skaggs (unpublished) and in vivo by feeding experiments on rats (weighing 100–200 gm.), with post-mortem examinations of the digestive tract of animals killed at various intervals following the feeding of a definite quantity of the milk. Curd tension determinations were also made with an American Curd-O-Meter. The data are presented in tables and in curves showing the progress of peptic and tryptic digestion in vitro.

The in vitro data were found to agree reasonably well with the in vivo data, but did not correlate with the curd tension values which proved for the most part unreliable, particularly for homogenized milk and to a lesser extent for trypsin treated milk, acidified milk, and base exchange treated milk. The digestibility of natural milk or pasteurized milk appeared to be roughly in inverse proportion to the curd tension, but no milk of this type was found to be as digestible, according to both in vivo and in vitro tests, as acidified milk, buttermilk, evaporated milk, and most samples of boiled milk. Evaporated milk and acidified milk showed more rapid digestion than any of the other types. The in vitro tests indicated very high initial digestion in the peptic period. This type of digestion is indicated by the very small curd particle size. Some samples of boiled milk, particularly boiled low curd tension milk, gave digestibility curves resembling somewhat those of evaporated and acidified milks, although not quite as satisfactory. All heated milks were acted upon by trypsin more rapidly than unheated milk.

It is concluded that curd particle size would be a more accurate index than curd tension of the digestibility of milk and its suitability for infant feeding.

Hydrogenated lard as a culinary fat, R. Jordan (*Indiana Sta. Rpt. 1938, pp. 69, 70*).—This progress report (E. S. R., 79, p. 704) summarizes the results obtained in a comparison of the desirability of five different fats for use in frying doughnuts of the cake type as determined by smoking of the fat and absorption of the fat by the doughnuts.

Cooking studies with frozen poultry. (Iowa State Col.). (*U. S. Egg and Poultry Mag., 45 (1939), No. 3, pp. 156–159*).—This and the following paper

report a continuation by K. Hoffman of poultry cookery research under the direction of B. M. Lowe (E. S. R., 75, p. 718). The objectives of the present study were comparisons of the quality of the poultry, both uncooked and roasted, which had been chilled overnight before freezing with properly matched birds frozen within 2 hr. after killing and of birds drawn before freezing with those frozen before drawing. The carcasses frozen before drawing were stored for periods of 10, 30, and 90 days, after which they were defrosted, drawn, and refrozen. The drawn birds were also stored for the same periods of time. A total of 56 birds of two breeds, Buff Orpingtons and White Rocks, held under the same conditions before killing, was used in the 8 treatments involved in the comparison. The tests included for the raw samples odor, fatness, condition of the skin and flesh, and color and for the roasted samples scoring by a modified score card based on that developed by the Cooking Committee of the Cooperative Meat Investigations.

The odor of the uncooked birds became somewhat undesirable on prolonged storage before drawing. After cooking the differences in odor between the drawn and not-drawn birds were still significant for the Buff Orpingtons but not significant for the White Rocks. It is suggested that part of the undesirable odors may have volatilized during cooking. The cooking times per pound were practically the same for all groups, and the cooking losses were not affected by the time in storage before drawing or by the chilling treatment. Chilling before freezing gave no more palatable product except for tenderness than freezing within 2 hr. after killing. Juiciness was not affected by storage before drawing or by the chilling treatment, but storage in general resulted in some degree of deterioration of all of the birds regardless of treatment. Tenderness of the muscles, as judged by the score card, was not affected by length of storage after freezing nor by chilling overnight before freezing for the Buff Orpingtons. For the White Rocks the birds chilled overnight before freezing were more tender than those frozen 2 hr. after killing. Shear test readings also indicated increased tenderness as a result of chilling before freezing.

More palatability studies with poultry. (Iowa State Col.). (*U. S. Egg and Poultry Mag., 45 (1939), No. 4, pp. 212–214*).—This paper reports a comparison of the effects on the quality of poultry of washing the internal cavity with a stream of water after drawing with simply wiping the cavity with a cloth. The carcasses were tested unfrozen and frozen.

In the unfrozen carcasses the differences were insignificant for the two treatments in the condition of the flesh, cooking losses, aroma and flavor on cooking, juiciness, tenderness, and pH (uncooked meat), but the carcasses which were washed scored significantly higher than those which had been wiped in the appearance of the skin. In the comparison of unfrozen with frozen carcasses, the unfrozen tended to be more flabby than the frozen, particularly with long storage, showed considerably smaller losses on cooking, and were more juicy, but had less desirable odor and flavor, particularly as the time of storage increased. The pH values of the uncooked meat of the unfrozen carcasses were significantly lower than those of the frozen carcasses immediately before cooking, but the values of the cooked birds were not significantly different.

[Comparative cost of home- and commercially produced white and whole wheat bread and rolls] (*Nebraska Sta. Rpt. [1938], pp. 45, 46*).—A summary is given of the results of this study in terms of the relative number of women baking bread at home or buying it, the types of fuel used and their relative cost for bread making, the factors affecting the cost of the product, comparative costs of home- and commercially made bread and rolls, and

factors which must be taken into consideration in determining which practice to follow.

Preservation of fruits and vegetables by freezing in the Pacific Northwest, H. C. Diehl, E. H. Wiegand, and J. A. Berry (*U. S. Dept. Agr., Bur. Chem. and Soils, 1939, MC-53, pp. II+58*).—This mimeographed circular has been prepared to meet the requests for information on the part of those who wish to use refrigerated locker plants for preserving home-grown foods for home use, and to some extent it represents a revision and expansion of information noted previously (E. S. R., 77, p. 724). The purpose of freezing preservation, the factors determining satisfactory freezing of fruits and vegetables, and the microbiology of frozen fruits and vegetables are first discussed, after which general suggestions are given for the preparation for freezing of berries, other fruits, and vegetables, with specific suggestions for several representatives of each group. For each a list is given of the varieties or types common to the Northwest which are best adapted to freezing, desirable varietal characteristics are pointed out, directions are given for harvesting, handling, and preparing the material for freezing, and the most suitable types of containers and methods of packing are indicated.

Canned baked apples, [I], II, J. Ruffley, Jr., J. A. Clague, and C. R. Fellers. (Mass. Expt. Sta.). (*Canning Age, 20 (1939), Nos. 2, pp. 68–70, 82, fig. 1; 4, pp. 179–181*).—This paper presents the results of a series of studies undertaken for the purpose of determining apple varieties most suitable for commercial canning as baked whole apples, the best methods for the preparation and baking of the apples, and the effect of the canning process on the vitamin C content. Much of the information presented is equally applicable to the home-canning process.

Glazing or cooking in a sugar sirup was found to give a more attractive and better tasting product than baking. A 40 percent sirup (40° Brix) was considered the best concentration. The substitution of 5 percent of the sugar by honey or 20 percent by dextrose is recommended as giving an attractive and well-flavored product. The time required for cooking varied from 5 to 15 min., depending upon the variety of apple, degree of maturity, size, and time held in storage. Of the varieties tested, those relatively high in pectin and acid content proved most satisfactory. These included Baldwin, York, Northern Spy, Rhode Island Greening, and Gravenstein, with preference for the first three because of their better color. Suggested additions for improvement in appearance and flavor are small amounts of certified color, spices, particularly pure oil of cinnamon, and acids such as 0.35 percent orthophosphoric, malic, or tartaric acid.

Tabulated data on canned apples of several varieties showed in each case a greater retention of vitamin C in the glazed than the baked, the losses averaging 65 percent in the baked and 44 percent in the glazed apples. The vitamin C content in the solid portion and sirup of canned glazed apples of different varieties was as follows: Northern Spy 60 and 60 International Units per 100 gm. for solid portion and sirup, respectively; Baldwin 40 and 60; Rhode Island Greening 20 and 20; Delicious 20 and 10; and York 10 and 20 units per 100 gm., respectively.

Growth and reproduction on a low fat diet, C. G. and J. B. Mackenzie and E. V. McCollum (*Biochem. Jour., 33 (1939), No. 6, pp. 935–943, fig. 1*).—The complete absence of lipids from the so-called "fat-free" diets heretofore used has been disproved by the lipid analysis of the two constituents of such diets (casein and yeast) which might possibly carry traces of lipids. Methods are described for preparing a defatted yeast extract, the fat content of which

did not exceed 0.01 percent and a casein in which the lipid content had been lowered from 1.45 to 0.02 percent. The basal diet as finally assembled contained a maximum lipid content of 0.0078 percent, of which 0.0022 percent was due to carotene and calciferol and 0.0056 percent to impurities in the casein and yeast. Of the two supplements which were given separately, methyl linoleate contained no lipid and a vitamin E concentrate given at a level of 5 mg. per rat twice weekly was estimated to contain at the most 70 percent of extraneous matter. This low fat diet has been found satisfactory for good growth and reproduction in rats. Feeding experiments on this diet, with and without vitamin E, have furnished no evidence for the existence of a hitherto unknown fat-soluble factor necessary for growth or reproduction in the rat. Early symptoms of paralysis in adult rats on the diet without vitamin E were completely prevented by a highly potent concentrate of vitamin E.

The specific dynamic effects of proteins when added in different amounts to a maintenance ration, M. Kriss. (Pa. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 6, pp. 565–581, fig. 1*).—Adopting the principle set forth in an earlier paper (E. S. R., 74, p. 79) that more significant measurements of the specific dynamic effects of food nutrients can be made if the heat production of the experimental animal, when maintained in energy and nitrogen equilibrium, is used as the base value instead of the fasting metabolism, the author has determined the specific dynamic effects of dried heart muscle, casein, and gelatin with rats at levels of 1.5 and 3 gm. per day as supplements to a basal maintenance ration, with the heat production on the maintenance ration alone as the base value.

Casein showed the greatest and heart muscle the smallest specific dynamic effect when this was expressed as total calories or as percentage of metabolizable energy. At the 1.5-gm. level the values in terms of calories per 24 hr. were casein 2.804, gelatin 2.280, and heart muscle 1.944 and as percentage of metabolizable energy 46, 40.7, and 26.4 percent, respectively. Expressed in calories per 100 calories of protein catabolized, the specific dynamic effect of each of the proteins was about the same at both levels of feeding. The net energy values of the supplements were also practically identical at the two planes.

"The results indicate that the specific dynamic effects of proteins may be satisfactorily determined within a certain range above the maintenance plane of nutrition, with the heat production of energy and nitrogen equilibrium as the base value."

The mineral and nitrogen metabolism of college women (*Nebraska Sta. Rpt. [1938], pp. 44, 45*).—This progress report describes the scope of the study and summarizes the results to date with respect to storage of minerals and nitrogen.

The calcium requirements of adult man and the utilization of the calcium in milk and in calcium gluconate, F. R. Steggerda and H. H. Mitchell. (Univ. Ill.). (*Jour. Nutr., 17 (1939), No. 3, pp. 253–262*).—This paper reports a long-time calcium balance experiment on a single adult male subject 35 yr. of age and normally weighing about 85 kg. The plan of the experiment was to subsist on a low calcium diet, with determinations of the daily loss of calcium in urine and feces, and then increase the calcium by stages by the addition of skim milk powder or calcium gluconate until calcium equilibrium was reached. Each period of definite calcium intake lasted from 12 to 32 days, although the collection periods were of only 4 days' duration.

On the basal diet furnishing an average of 195 mg. of calcium daily, the average daily balances obtained in three periods were −99, −121, and −109 mg.,

with an average of −110 mg. The average excretion amounted to 304 mg. daily, of which 68 percent was by way of the intestinal tract. Approximate equilibrium was secured when the diet was supplemented with 40 gm. of skim milk powder furnishing 542 mg. of calcium, the average balances over two 20-day periods being −7 and −4 mg. daily. Skim milk powder in amounts of 50 gm. daily was no more effective than 40 gm.

In periods in which the additional calcium was furnished as calcium gluconate, an amount furnishing 639 mg. of calcium daily gave an average balance of +53 mg. and in an amount furnishing 482 mg. a balance of −26 mg. By interpolation the amount of calcium from this source necessary for equilibrium was estimated to be about 534 mg. or practically the same as when furnished by milk.

The total calcium on which equilibrium was obtained, 735 mg. (including 540 mg. in the supplement and 195 mg. in the basal diet), amounted to about 9.2 mg. per kilogram of body weight as compared with an average of 9.75 mg. derived by Mitchell and Curzon from a review of all available data. As 540 mg. was required to change the average daily balance from −110 mg. to approximately 0, it is concluded that the calcium in both milk and calcium gluconate is utilized only to the extent of about 20 percent.

A long-term experiment with rats on a human dietary.—II, Calcium and phosphorus depletion and replacement, W. E. Gaunt, J. T. Irving, and W. Thomson (*Jour. Hyg.* [*London*], *39* (*1939*), *No. 2, pp. 91–108, fig. 1*).—An extension to the third generation of rats of the comparison of milk and green vegetables with calcium and phosphorus salts as supplements to a poor human dietary (E. S. R., 79, p. 709) is reported, with results confirming those of the earlier study. The diet supplemented with the calcium and phosphorus salts proved as effective as that containing milk and green food furnishing equivalent amounts of calcium and phosphorus in promoting reproduction, bone calcification, and tooth formation, and in inducing growth in the first generation, but proved incapable of maintaining the same growth rate over several generations. It is concluded that calcium and phosphorus were the chief but not the only deficiencies in the human dietary tested.

The iron of human blood serum, B. S. Walker (*Jour. Lab. and Clin. Med.*, *24* (*1938*), *No. 3, pp. 308–315*).—A simple method for the measurement of the total iron of blood serum, based on the Fowweather method, is described, and data obtained with it are reported for the serum iron of 12 normal medical students, 2 untreated and several treated cases of pernicious anemia, a number of cases of hypochromic and other types of anemia, and 2 cases of polycythemia.

The values obtained for the normal subjects ranged from 0.04 to 0.23 mg., with a mean value of 0.13 mg. or iron per 100 cc. of serum. The untreated cases of pernicious anemia gave values slightly above the normal, 0.27 and 0.3 mg. per 100 cc., respectively. Under liver therapy these values dropped gradually to within the normal range. In hypochromic anemia the values were low but seldom below 0.04 mg. per 100 cc. Treatment with iron was followed by a rise to normal in the serum iron. In aplastic and hemolytic anemias the values were high. In 1 of 2 cases of polycythemia the value obtained was below normal and in the other above normal.

Bone development in normal and rachitic rats, W. C. Russell, M. W. Taylor, and M. T. Duncan. (N. J. Expt. Stas.). (*Jour. Nutr.*, *18* (*1939*), *No. 1, pp. 27–33, figs. 3*).—The bone development in stock colony rats from 3 to 54 days of age and in similarly reared rats receiving a rachitogenic ration from 24 to 54 days of age was studied by obtaining radii at 3-day intervals and photographing the split, stained sections. The average width of the epiphyseal

cartilage for rats on the stock colony ration decreased continuously and tended to become constant after about 36 days of age. The narrowing of the epiphyseal cartilage ceased within 3 days after the animals were placed on the deficient ration, and a widening began which continued for from 18 to 27 days, after which no further widening occurred. Growth rate was markedly retarded immediately after the rats were placed on the rachitogenic ration.

Heat loss from the human body, E. F. Du Bois (*Bul. N. Y. Acad. Med., 2. ser., 15 (1939), No. 3, pp. 143–173, figs. 13*).—In this lecture, delivered before the Harvey Society, December 15, 1938, the literature on the subject is reviewed, and the extensive investigations of the author and his associates on the relation between heat production and heat losses under various conditions (E. S. R., 80, p. 578) are discussed in considerable detail. In conclusion, various suggestions are given as to future applications of work of this type.

[Vitamin studies by the Idaho Station] (*Idaho Sta. Bul. 229 (1939), pp. 32, 33*).—Progress is reported on studies of the factors of the vitamin G complex in potatoes and the relative requirements of male and female rats for vitamin E as present in wheat germ oil.

The vitamin content of green string beans when cooked or canned and stored, H. L. Mayfield and J. E. Richardson (*Montana Sta. Bul. 373 (1939), pp. 14*).—The Burpee Stringless Green Pod variety of string beans raised under irrigation in the experimental gardens of the station at an altitude of 4,800 ft. was used in this study of the effect of cooking by ordinary household methods and of canning in the pressure cooker, with suitable corrections for the elevation, on the content of vitamins A, B_1, and C in green string beans. The canned beans were tested after 6 mo. of storage both when freshly opened and after reheating. Additional vitamin C studies were made on some of the beans canned both in glass and in tin and opened at monthly intervals. Biological growth methods were used for vitamins A and B_1 in comparison with the U. S. P. reference cod-liver oil for vitamin A and the international standard clay for vitamin B_1. For vitamin C both curative methods with guinea pigs and chemical methods by indophenol titration were used.

In comparison with the raw beans, which were found to be a good source of vitamin A and vitamin B_1 and an excellent source of vitamin C, the freshly cooked beans were estimated to have lost none of their vitamin A or B_1 potency and from 30 to 40 percent of their vitamin C. The canning process itself caused no greater destruction of vitamin C than cooking, but within the 2 months' storage before the first tests of the effect of increased length of storage were made there was a notable decrease in the C content of the beans in both the glass- and tin-canned products. There seemed to be little further deterioration in the tin cans but a gradual decrease in the beans canned in glass.

An average serving of 70 gm. of the cooked or canned beans was estimated to supply the various vitamins in the following quantities: For freshly cooked beans vitamin A 840 International Units, vitamin B_1 23 I. U., and vitamin C from 7 to 12 mg.; for the canned beans stored 6 mo. and reheated on opening, vitamin A 700 I. U., vitamin B_1 14 I. U., and vitamin C 3 mg.

The distribution of vitamin B_1 (thiamin) in meat and meat products, O. Mickelsen, H. A. Waisman, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 3, pp. 269–280*).—The vitamin B_1 content of various meats and meat products was determined in the raw state and for a limited number of products after cooking by various household methods. The rat growth method was used with the basal diet of Arnold and Elvehjem (E. S. R., 80, p. 562). Each series was composed of about 40 rats weighing between

35 and 45 gm. at the beginning of the experiment. All of the animals were kept on the basal ration for 1 week and then groups of two rats, a male and female, were given as supplements graded amounts of the tissues ground and dried in thin layers in a current of warm air at 45°–60° C. One group was kept as negative control on the basal ration alone and one received 80 µg. of crystalline vitamin B_1 per 100 gm. of ration. The assays were made over a 6-week period, with weekly weighings. The increases in body weights of the test groups were compared with the standard group and the vitamin B_1 value calculated by a simple proportion.

On the dry weight basis the highest values obtained were with pork muscle. Two samples of pork loin gave values of 13 and 20 International Units per gram, 2 of pork ham values of 11 and 20, and 1 of smoked ham of 11 I. U. per gram. The higher values were obtained from animals slaughtered later in the season and presumably older. Like differences were obtained with the flesh of pullets and of cockerels nearly 3 yr. old, although the concentration of the vitamin was much lower than in the pork. The dark meat of the pullets contained 1 and of the cockerels somewhat less than 1.8 I. U. and the light meat 2.5 and 3 I. U., respectively, per gram. Beef round contained 3 and leg of lamb 4 I. U. per gram. A composite sample of beef heart from 8 animals contained 10 and a sample of pork heart 8 I. U. per gram. Corresponding values for kidney were 5 and 8 and liver 4 and 5.3 I. U. per gram. The values for beef kidney, liver, and spleen were in good agreement with those reported by Arnold and Elvehjem, using the chick growth method (E. S. R., 81, p. 455).

The samples used for cooking were commercial cuts of meat which were tested before and after cooking according to the directions given by Child (E. S. R., 80, p. 846). The values obtained are reported in terms of the percentage of destruction of the vitamin by different methods of cooking as follows: Frying—beef round and pork ham no loss, veal hindquarter 45 percent, smoked ham 10, and pork loin 35 percent; roasting—beef round 61, veal hindquarter 58, and pork loin 50 percent; broiling—beef round 50 percent; baking—pork loin 50 percent; and stewing—beef heart 55 and beef kidney 40 percent.

The data are discussed with reference to the contribution of meat and meat products to vitamin B_1 requirements, using the Williams and Spies estimates of from 200 to 500 I. U. daily (E. S. R., 80, p. 710), with the conclusion that "even though meats are used in the diet to the extent of only 7 percent, they are capable of supplying one-third of the human vitamin B_1 needs. When meat such as pork is used, the proportion of the day's requirement thus supplied is correspondingly increased. A pork chop, even when fried, may supply the total daily requirement of this vitamin."

New procedure for the chemical determination of vitamin B_1 in natural media [trans. title], P. Meunier and C. Blanchain (*Bul. Soc. Chim. Biol., 21 (1939), No. 5, pp. 649–664, figs. 5*).—The electrocolorimetric method described is based upon the discovery that the same part of the thiamin molecule is attacked in the reaction with diazotized sulfanilic acid in an alkaline medium as proposed by Kinnersley and Peters [6] and in the production of the thiochrome by the oxidizing action of ferricyanide, also in alkaline medium as proposed by Jansen (E. S. R., 77, p. 298). The nonspecificity for thiamin in either test alone is overcome by conducting the Kinnersley and Peters test with and without potassium ferricyanide. Using the process of kinetic colorimetry, the authors have found that, as in the case of vitamin C, the reaction of vitamin B_1 is com-

[6] Biochem. Jour., 28 (1934), No. 2, pp. 667–670.

pleted more rapidly than with other substances which also give the test. Consequently, the readings are taken at 30 sec. and at 1 min.

Various methods in use for determining thiamin are reviewed, the technic proposed is described in detail, and the application of the method to the determination of thiamin in various yeasts and of pure thiamin in the presence of certain interfering substances is discussed.

Does vitamin B complex or B_1 aid digestion and gastro-intestinal conditions? H. McDonell. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 18 (1939), No. 11, pp. 338, 339, fig. 1*).—This is a brief review of the somewhat conflicting evidence on the question as to whether vitamin B_1 alone or the vitamin B complex is of greater aid in digestion and the prevention or correction of gastrointestinal disturbances.

The question of the regulation of the detoxifying processes by vitamin B_1 [trans. title], H. Blotevogel and E. Tonutti (*Klin. Wchnschr., 18 (1939), No. 13, p. 471*).—On the principle that by increasing the liver glycogen the detoxifying properties of the liver cells are correspondingly increased, the authors have used injections of massive doses of vitamin B_1 with dextrose for the treatment of severe burns. In 17 cases in which the treatment has been applied the dosage has consisted of up to 10 mg. Benerva (a vitamin B concentrate) in 10 cc. of a 10 percent dextrose solution four times a day. Two of the subjects who had severe burns covering over two-thirds of the body surface and were not treated until the third day died on the sixth and seventh days, but even in these there was prompt relief of the smarting soon after the administration of the dose. In all of the other cases there was rapid recovery.

The influence of the diet and energy intake upon acute vitamin B_1 deficiency in the rat, G. A. Schrader and C. O. Prickett. (Ala. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 6, pp. 607-620*).—In this comparison of the effectiveness of various diets in producing neuromuscular symptoms of vitamin B_1 deficiency in the young rat, as described by Prickett (E. S. R., 72, p. 884), the most effective diets studied were those in which carbohydrate (sucrose or cornstarch) and fat (coconut fat) each furnished approximately half of the nonprotein source of energy.

On these diets about 90 percent of the rats developed the neuromuscular symptoms. The time of onset was influenced both by the method of feeding and by the nature of the nonprotein constituents of the diet, but was longer on limited (isocaloric) feeding than on ad libitum feeding. Replacement of one-half of the energy from the carbohydrate by its equivalent in coconut fat had no effect in the ad libitum feeding but increased the time in the limited feeding procedure. Replacement of cornstarch by dextrinized starch or three-fourths of the sucrose by coconut fat increased the time in both methods. Both of these replacements more than doubled the energy intake before the onset of the symptoms. On the limited feeding loss in weight was less rapid and less marked and anorexia less acute than on the ad libitum feeding.

The authors conclude that if the proper diet is used the incidence of the neuromuscular symptoms of acute vitamin B_1 deficiency is so consistent in young rats that these symptoms serve equally well as the basic criterion of acute vitamin B_1 deficiency in the rat as in the pigeon and chick.

Adrenal atrophy and senescence produced by a vitamin deficiency, A. F. Morgan and H. D. Simms. (Univ. Calif.). (*Science, 89 (1939), No. 2320, pp. 565, 566*).—An extension of the observations concerning the graying of the fur of rats on diets deficient in the filtrate factor or factors (E. S. R., 79, p. 566) is noted in this preliminary communication. Young rats of mothers deprived of the factor from the date of birth of the young developed the graying as early as 8 weeks of age. Litters of mothers deprived of the factor from the day of

mating were of normal size and weight, but none could be reared to weaning age. In rats kept in the deficient state for several months, ulcers reminiscent of the leg ulcers of nutritional origin and reported from the Tropics developed. These were not cured by crystalline vitamin B_6, but were cured rapidly by concentrates of the filtrate factor. Graying was also cured by the filtrate factor concentrates and by injections of relatively large doses of adrenal cortex extract but not by additional vitamin B_1, B_6, riboflavin, copper or iron, nicotinic acid, or epinephrin. Histological studies of animals suffering from this deficiency revealed striking atrophy of the adrenals, loss of elastic layer of the skin, failure of spermatogenesis, and atrophy of hair follicles, with intermediate stages paralleling the graying and regenerative stages during recovery. The unknown factor is thought to affect particularly the function of the adrenal cortex. Whether or not the factor is the same as the antichick pellagra filtrate factor of Lepkovsky et al. (E. S. R., 76, p. 839) has not been determined.

The vitamin C content of sulfured and nonsulfured grape juice [trans. title], K. H. Büsing and W. Raabe (*Klin. Wchnschr., 17 (1938), No. 50, pp. 1766–1768*).—A commercial grape juice during the preparation of which enzymes and micro-organisms are destroyed by a method of electric heating which does not raise the temperature above 68° C. and all air is removed before sealing was found to have an ascorbic acid content, as measured chemically, of 14.5 mg. per liter in samples taken from freshly opened bottles. The value fell rapidly after the bottle had been opened even if resealed. Grape juice preserved with sulfites was without antiscorbutic effect when tested on guinea pigs. The authors are of the opinion that the treatment of foods with sufurous acid is destructive of vitamin C and should not be permitted.

The content of vitamin C in gastric juice [trans. title], M. Demole and A. Issler (*Compt. Rend. Soc. Biol. [Paris], 130 (1939), No. 12, pp. 1225, 1226*).—Samples of pure gastric juice from 32 subjects were analyzed for ascorbic acid by indophenol titration, with verification of the absence of other reducing agents. Minimum, maximum, and average values obtained, grouped by the degree of acidity of the juice, are as follows: For 9 samples with less than 1 part HCl per 1,000, 0.15, 0.8, and 0.43 mg. per 100 cc.; for 13 samples with normal acidity (between 1 and 2 parts per 1,000), 0.25, 1.5, and 0.71 mg.; and for 10 with more than 2 parts of HCl per 1,000, 0.45, 0.98, and 0.68 mg. per 100 cc. It is noted that these figures correspond to the published values of Peters and Martin (E. S. R., 77, p. 887). Although the content of vitamin C was particularly low in the achylous subjects, the variations between normal and hyperacidic juices were inconsistent and slight.

Influence of vitamin C saturation on the gastric juices [trans. title], A. Issler and M. Demole (*Compt. Rend. Soc. Biol. [Paris], 130 (1939), No. 12, pp. 1227, 1228*).—Eight of the subjects noted above were given saturation tests with ascorbic acid to determine to what extent the vitamin C content of gastric juice is affected by saturation. Although the ascorbic acid content of the samples was in all cases higher than before saturation, the differences were very slight in comparison with changes in the urine and showed no relation to the degree of saturation. The acidity of the juice as HCl remained practically unchanged.

Blood studies of vitamin C during pregnancy, birth, and early infancy, [I, II], C. E. Snelling and S. H. Jackson (*Jour. Ped., 14 (1939), No. 4, pp. 447–451, fig. 1*).—This report is presented in two parts. In the first part, by S. H. Jackson, the technic of the method followed, which is essentially the same as the macromethod described by Mindlin and Butler (E. S. R., 80, p. 728) using the Evelyn photoelectric colorimeter, is described in detail.

In the second part, by C. E. Snelling, data are reported on the application of the method to the determination of plasma ascorbic acid of women in successive stages of pregnancy, the relation of the plasma ascorbic acid of breast-fed infants to the content of the vitamin in their mothers' milk, and a comparison of the plasma ascorbic acid of artificially fed and breast-fed infants in the same age group. In the first series the average values of the plasma ascorbic acid of groups of from 6 to 13 women at each of the periods of pregnancy studied showed a progressive decrease from 0.6 mg. per 100 cc. up to 5 mo. to 0.42 mg. at full term and 0.23 mg. per 100 cc. immediately after delivery. The cord blood ascorbic acid varied from 0.1 to 1.47 mg., with an average of 0.77 mg. per 100 cc. as compared with values of 0, 0.92, and 0.23 mg. per 100 cc. for the maternal blood. Five infants with plasma ascorbic acid content of from 1 to 2 mg. per 100 cc. had received breast milk, which contained more than 4 mg. per 100 cc. Of 5 others with a plasma content of from 0.7 to 1 mg. per 100 cc., 4 had received breast milk containing over 4 mg. and 1 below 2.5 mg. per 100 cc., and 3 whose blood contained from 0 to 0.5 mg. were all receiving milk with less than 2.5 mg. of ascorbic acid per 100 cc. In 12 artificially fed infants ranging from 1 week to 3 mo. of age who were receiving no vitamin C additions, minimum, maximum, and average plasma ascorbic acid values were 0.05, 0.52, and 0.19 mg. per 100 cc. Corresponding values for 15 breast-fed infants all under 3 mo. of age were 0, 1.6, and 0.91 mg. per 100 cc.

"As a result of these studies, the following recommendations are made: Artificially fed babies should receive additional vitamin C from the time they are 2 weeks of age. The mothers of breast-fed babies should have adequate vitamin C in the diet, and, if there is any question of lack in the mother's diet, the baby should receive additional vitamin C."

The clinical assessment of nutrition, E. H. Wilkins (*Pub. Health* [*London*], *52* (*1939*), *No. 10, pp. 296–300*).—In this paper, read at a meeting of school medical officers in Birmingham, England, the topics discussed include low weight: height ratios as evidence of malnutrition, posture as an index and cause of ill health, quality and texture of the skin apart from classical deficiency diseases affecting the skin, pallor and anemia, brightness of the eye and luster of the hair as indeterminate and misleading factors, and dental caries and bone deformities. It is emphasized that the assessment of the nutritional state of children of school age tends to lack precision, and should be checked as far as possible by information on the actual diets and incomes of the families from which the children come.

Treatment of rickets and tetany with a single massive dose of vitamin D; vitamin D shock therapy, H. Vollmer (*Jour. Ped.*, *14* (*1939*), *No. 4, pp. 491–501, fig. 1*).—Three clinical reports with X-ray and laboratory data are given in support of the statement that rickets and tetany in children can be cured by peroral administration of a single dose of 600,000 International Units of vitamin D incorporated in milk. In these and other cases observed by the author and reported from other laboratories, there were no symptoms of toxicity and no contra-indication. Under this treatment the curative effect is said to be more prompt than that obtained with the daily administration of small doses, the serum calcium and phosphorus become normal, and roentgenographic evidence of calcification shows within a week. Hypernormal values of serum phosphorus may occur after the shock therapy, but they usually decline to a normal level in from 2 to 4 weeks. The method is thought to have particular value in neonatal and infantile tetany, severe rickets, rickets associated with pneumonia or pertussis, rickets associated with chronic infections, and in cases where the parents of a rachitic or tetanic child are indifferent or unreliable. The possibility of a

successful vitamin D shock prophylaxis over the entire winter period with a single dose of 400,000–600,000 I. U. is discussed. For this purpose the subcutaneous administration of the dose is recommended as possibly being superior because the injection would be given by the physician and there would thus be a guarantee of the administration of a precise quantity at a known time.

Vitamin E destruction by rancid fats. J. WEBER, M. H. IRWIN, and H. STEENBOCK. (Wis. Expt. Sta.). (*Amer. Jour. Physiol., 125 (1939), No. 3, pp. 593–600*).—In this investigation of the effect of rancid fats of known peroxide value and of various aldehydes, ketones, and other decomposition products which may be present in rancid fats on the destruction of vitamin E, a diet similar to that of Olcott and Mattill (E. S. R., 71, p. 731) was used to produce vitamin E deficiency in rats and a partially hydrogenated vegetable shortening as the standard material for restoring fertility in female rats. This fat, with proper treatment, was also used as a rancid fat to test the destruction of vitamin E.

The untreated fat, when incorporated in the basal diet at a 5-percent level, was capable of restoring fertility in female rats whose previous gestations had ended in resorption. This activity was destroyed by certain fats made rancid by aeration, by heat in the presence of oxygen, by treatment with ozone, or by the addition of palmitic peroxide, but was not destroyed by fats heated under nitrogen reflux nor by fats to which acrolein, allyl alcohol, or straight chain aldehydes and ketones had been added. No destruction of the vitamin occurred when the source of the vitamin and the rancid fat were fed separately. The destructive action of a fat made moderately rancid by aeration was not overcome by increasing the amount of vitamin E three times above the minimum necessary for fertility.

Studies on the vitamin K requirements of the rat, J. D. GREAVES (*Amer. Jour. Physiol., 125 (1939), No. 3, pp. 429–436*).—Vitamin K deficiency symptoms (hemorrhagic tendencies associated with low blood prothrombin values) were produced in 12 out of 77 rats on a modification of the Almquist vitamin K-free basal diet for chicks (E. S. R., 76, p. 581), and the symptoms were cured by vitamin K concentrates. In the majority of the animals, however, the deficiency could not be produced by dietary means alone but necessitated partial block in the drainage of bile into the intestinal tract. Bile fistula and jaundiced rats, as well as normal rats raised for extended periods of time on a vitamin K-free diet still excreted appreciable amounts of vitamin K. This is thought to suggest the synthesis of minimum amounts of the factor in the intestinal tract.

The nature of the factor which is concerned in loss of blood coagulability of bile fistula and jaundiced rats, J. D. GREAVES (*Amer. Jour. Physiol., 125 (1939), No. 3, pp. 423–428*).—This paper confirms earlier work showing that the marked bleeding tendency of the bile fistula or jaundiced rats is associated with an increased bleeding time and low blood prothrombin values and can be cured by the administration of vitamin K concentrates in the presence of bile salts.

[Fortification of foods] (*Milbank Mem. Fund Quart., 17 (1939), No. 3, pp. 217, 221–262, figs. 2*).—The papers listed below were presented at a symposium on the subject at the 1939 meeting of the Institute of Nutrition: Fortification of Foods With Vitamins and Minerals, by A. F. Morgan (pp. 221–229) (Univ. Calif.); Fortification in a General Program for Better Nutrition, by L. J. Roberts (pp. 230–240); The Public Health Aspects of the Fortification of Foods With Vitamins and Minerals, by W. H. Sebrell (pp. 241–247); Governmental Control Problems in the Fortification of Foods With Vitamins and Minerals, by E. M. Nelson (pp. 248–254) (U. S. D. A.); and Retention, Restoration, and Fortification of Vitamins in Foodstuffs, by A. E. Taylor (pp. 255–262).

The requirements of the dog and the rat for nicotinic acid, T. W. BIRCH (*Jour. Nutr., 17 (1939), No. 3, pp. 281–292, figs. 3*).—This paper is presented in two parts, in the first of which evidence is reported leading to the conclusion that the minimum protective dose of nicotinic acid for dogs is about 1 mg. daily for an animal weighing from 5 to 10 kg. On a body weight basis, a rapid increase in weight and complete protection were secured on 0.25 mg. of nicotinic acid per kilogram, a slight increase in weight and complete protection on 0.13, and no protection on 0.084 and 0.027 mg. per kilogram of body weight.

In the second part the conflicting literature on the need of nicotinic acid by the rat is reviewed, and evidence is reported leading to the conclusion that nicotinic acid is not an essential substance for the rat.

Studies on experimental rickets in rats.—II, The healing process in the head of the tibia and other bones, G. S. DODDS and H. C. CAMERON. (W. Va. Expt. Sta.). (*Amer. Jour. Pathol., 14 (1938), No. 3, pp. 273–296, pls. 6, fig. 1*).—In continuation of an earlier investigation of the outstanding structural changes in the bones of rats during the active phases of rickets, with special reference to the behavior of the epiphyseal cartilage in the head of the tibia,[8] the authors have made a similar study of the healing process as brought about mainly by the administration of irradiated ergosterol to young rats in which well-developed rickets had been produced by the Steenbock-Black rachitogenic diet. Observations are reported on 26 normal controls, 31 in various stages of rickets, and 68 in various healing stages. For 35 of the animals three records were obtained: (1) X-ray photographs at weekly or more frequent intervals, (2) microscopic sections stained with hematoxylin-eosin, and (3) silver preparations similar to the line test but carried further. For all of the other animals the first two records were obtained. The X-ray films included all the bones of the legs of all of the animals, microscopic sections from the distal end of the femurs and of the radius and ulna, and particularly the head of the tibia. The 12 X-ray stages of Bourdillon et al. (E. S. R., 68, p. 132) were used as a scale for measuring the progress of the healing but with a series of X-ray photographs from the authors' own material as a standard.

"The first indication of healing was calcification in the rachitic metaphysis close to the edge of the epiphyseal cartilage, whence it spread, first through the metaphysis toward the shaft and later into the cartilage toward the end of the bone. The preliminary reorganization of the metaphysis involved provisional dilute calcification of the osteoid, calcification of the exposed cartilage trabeculae, increase in amount of marrow, and its restoration to normal structure. The changes restored a somewhat normal configuration of trabeculae by exposing the rather parallel cartilage trabeculae. The end of the shaft undergoes much the same changes. At the same time the projecting cartilage masses became calcified and were partly removed, leaving calcified trabeculae very similar to those in the metaphysis. During the latter half of healing the shape of the bone became corrected, hematogenetic marrow formed in the new end of the shaft which had been formed from the metaphyseal region, cupping was corrected, the entire epiphyseal cartilage became normal in thickness and structure, and the reorganized trabeculae attained normal dense calcification."

Mottled enamel in South Dakota, H. T. DEAN, E. ELVOVE, and R. F. POSTON (*Pub. Health Rpts. [U. S.], 54 (1939), No. 6, pp. 212–228, figs. 2*).—This survey, conducted by the U. S. Public Health Service with the assistance of the South Dakota State Board of Health, covered a total of 53 cities, towns, and rural communities in 21 counties, with a total of 3,350 school children examined. In one

[8] Amer. Jour. Anat., 55 (1934), No. 1, pp. 135–160, pls. 3, figs. 2.

community where the water supply had been changed in 1928 from a deep artesian well to a dug shallow well, the survey showed in children of different ages the change in the mottled enamel condition of the teeth effected by the change in water supply. On the basis of this survey it is concluded that endemic mottled enamel in South Dakota is limited solely to users of artesian water obtained from the Dakota sandstone. This, however, includes an endemic condition in 41 communities divided among 20 counties, with a border line degree of endemicity in 5 counties and 30 other places listed as probably endemic areas.

Deficiency diseases in Kashmir, D. C. WILSON (*Lancet* [*London*], *1939, I, No. 17, pp. 1019–1021, figs. 5*).—In connection with a comparative dietary survey in various communities in India clinical examinations of the children were made, a brief report of which for Kashmir is presented. Records of height and weight of 406 children of from 5 to 15 yr. of age showed that the Kashmir girls tended to be shorter and lighter than English girls of the same age, but there was little or no difference in the boys who, however, were heavier than boys from south Indian towns. A remarkably low incidence of dental caries was shown. Various deficiency diseases occurred among the children and adults. Phrynoderma or toad skin was seen in 10 percent of the children, angular stomatitis in 3, and rickets in 2 percent. Late rickets, osteomalacia, beriberi, and pellagra were found among the adults. Night blindness and scurvy were noted occasionally at the outpatient departments of hospitals. Stone in the bladder was not commonly met.

Studies in nutritional anemia of the rat.—I, The influence of the spleen on recovery, C. J. HAMRE and C. D. MILLER. (Hawaii Expt. Sta.). (*Folia Haematol.* [*Leipzig*], *61* (*1938*), *pp. 224–238*).—In this extension of an earlier investigation in which marked changes were noted in the spleens of rats made anemic on a milk diet (E. S. R., 74, p. 286), 16 anemic rats were splenectomized and fed curative agents, and recovery was compared with that of 15 anemic animals which had not been splenectomized but had been subjected to laparotomy only. After the operative treatment, all animals were fed 0.5 mg. of iron and 0.25 mg. of copper daily in addition to milk. Hemoglobin determinations, blood cell counts, and blood smears were made for all of the animals on the day of operation and at the beginning of the supplementary feeding. The blood studies were made daily for 21 days for 12 splenectomized and 13 control animals. For the others the blood samples were taken daily to the ninth day and then on the eleventh, fourteenth, and twenty-first days. All the animals were killed and autopsied at the end of the period of observation.

All of the animals recovered promptly, and the blood pictures were practically normal at the end of 14 days. The similar rate and degree of recovery of the splenectomized and nonsplenectomized animals is thought to furnish definite proof that the spleen is not necessary for recovery from nutritional anemia. A marked increase in the number of normoblasts and leucocytes in the circulating blood occurred on the second and on the fifth or sixth days of recovery for all animals, but the increase was much greater in the splenectomized than in the control animals. These observations are thought to suggest that splenectomy temporarily disturbs hematopoietic processes, and that a new equilibrium is established at about the seventh or eighth day.

Anemia caused by feeding cholesterol to guinea pigs, R. OKEY and V. D. GREAVES. (Univ. Calif.). (*Jour. Biol. Chem., 129* (*1939*) *No. 1, pp. 111–123, fig. 1*).—When 1 percent cholesterol was fed to guinea pigs in addition to an adequate synthetic diet, the livers became greatly enlarged and fatty and after about 5 weeks the animals became seriously anemic. The red cell counts in some instances fell 2 or 3 million within 2 or 3 weeks, nucleated red cells ap-

peared, and blood slides showed cells in the process of degeneration. Splenic enlargement took place simultaneously with the blood changes, the spleens increasing to about 10 times their normal size within from 7 to 9 weeks. The tissues of animals killed after from 7 to 9 weeks on the cholesterol diet showed an increased free cholesterol content of the liver, spleen, heart, lungs, and blood and lower lecithin values than normal. The livers on histological examination showed fatty infiltration and cellular destruction and the spleen engorgement with cellular debris and gross necrosis.

The results are thought to indicate that "while esterified cholesterol is to be regarded as physiologically comparatively innocuous, cholesterol in a free state must have a very definite effect on cell structure and on the capacity of the cell to take up nutrient substances from water solution."

TEXTILES AND CLOTHING

Adequacy of labeling of certain textile fabrics with regard to fiber content, H. Fletcher and L. Dennhardt. (Kans. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *58* (*1939*), *No. 12*, *pp. 895–903*, *pls. 3*).—The investigation reported was undertaken to determine to what extent authentic information is available to the purchaser of textile fabrics concerning fiber content. A total of 268 fabrics was purchased in 18 stores in 7 towns and cities of the Midwest. At the time of purchase information on the labels or material with reference to fiber content was noted and in all cases where there was no information the salesman was questioned. The methods followed in the identification and analysis of the fabric included microscopic identification and quantitative mechanical, chemical, and microscopical analyses of the mixed fiber fabrics.

Of the 133 fabrics made of one type of fiber, 57 were labeled and of these labels 23 proved to be accurate, 32 partially accurate, and 2 inaccurate. Information secured from the salesman on 79 fabrics proved accurate for 25, partly accurate for 48, and entirely inaccurate for 6. The inaccuracies were chiefly in the three types of rayon fabrics—acetate, cuprammonium, and viscose rayon. Of the 135 mixed fabrics, 117 were made of 2 and 18 of 3 kinds of fiber. Only 34 of these fabrics were labeled and the information was not completely accurate for any of them. Information secured from the salesman for 110 of the fabrics was accurate for 9, partly accurate for 94, and completely inaccurate for 7.

HOME MANAGEMENT AND EQUIPMENT

[**Equipment studies by the Indiana Station**], G. M. Redfield (*Indiana Sta. Rpt. 1938*, *pp. 68, 69*, *fig. 1*).—This progress report includes summaries of an extension of the study of refrigeration for the farm household and farm produce (E. S. R., 79, p. 718) and of a study of small electric mixers and beaters for household use.

Further studies of selected types of domestic gas stoves, A. E. Baragar (*Nebraska Sta. Res. Bul. 111* (*1939*), *pp. 24*, *figs. 15*).—The investigation previously noted (E. S. R., 77, p. 140) has been extended to similar studies of six gas ranges, all with small round surface burners and all but one with the enclosed type of top with either removable or fixed burner bowls. Special attention has been paid to causes of the production of excessive carbon monoxide gas by the top burners, more data have been obtained on cooking top efficiencies, and automatic lighters have been studied further. The most extensive work reported, however, was on oven tests, including checks on thermostat calibra-

tion, temperature distribution, and heat losses. A special apparatus was devised for measuring vent losses and is described and illustrated.

The significant results obtained in the investigation as a whole have been expressed in the form of a list of optimum requirements of cooking tops and ovens for gas ranges to insure satisfactory performance for economical operation. This list constitutes a set of specifications of value to the prospective purchasers of a gas range whether it be for natural, manufactured, or bottled gas.

Performance analysis of selected types of kerosene stoves, M. M. Monroe (*Maine Sta. Bul. 394 (1939), pp. 434-521, figs. 24*).—This report of an extensive investigation of the performance of kerosene stoves of different types has been prepared to be of service to other investigators on cook stoves, teachers of household equipment, extension service workers, manufacturers of kerosene stoves, and others particularly interested in the principles of heat transfer for cooking. The first section of the bulletin contains material of a general nature on the principles involved in surface burner and oven cooking with ranges of temperature required, and the various types of kerosene stoves and the principles on which their operation depends. The procedures and results of the present investigation are then discussed in considerable detail for surface and oven cooking, with tables and charts reporting the original data. This technical section is followed by an appraisal of the performance and construction of the stoves tested in which standards for appraising oven and surface burner performance are given in the form of questions and answers for the types of stoves tested. The summary is divided into three parts. The first includes the practical applications of the study which are of interest to the housewife, the second consists of suggestions to manufacturers for improvements in the construction of kerosene stoves, and the third lists for the benefit of other investigators certain precautions to be taken in controlling the testing conditions.

Buying and using kerosene stoves, M. M. Monroe and E. M. Cobb (*Maine Agr. Col. Ext. Bul. 251 (1938), pp. 23, figs. 6*).—This nontechnical bulletin has been prepared, chiefly from information obtained in the investigation noted above, to acquaint the housewife with some of the characteristics of kerosene stoves of the three general types of long-chimney wick burners, short-chimney wick burners, and short-chimney wickless burners. The question and answer method of presenting the information is used throughout the text, prefaced by brief statements as to the performance which can be obtained from some kerosene stoves and the details of construction which add to the durability of the stove.

Studies in family life [of the Nebraska Station] (*Nebraska Sta. Rpt. [1938], pp. 46, 47*).—This progress report summarizes the results of a comparison of the adequacy of personality judgments, as determined by the method previously described (E. S. R., 80, p. 571), of farm, small town, and city young people in the State.

MISCELLANEOUS

Abbreviations used in the Department of Agriculture for titles of publications, C. Whitlock (*U. S. Dept. Agr., Misc. Pub. 337 (1939), pp. 278*).—This supersedes Department Bulletin 1330 (E. S. R., 53, p. 599).

Report of the Hawaii Agricultural Experiment Station, 1938, [L. A. Henke et al.] (*Hawaii Sta. Rpt. 1938, pp. 101, figs. 11*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

High lights in agricultural research in Idaho: Forty-sixth Annual Report [of Idaho Station] for the year ending December 31, 1938, C. W. HUNGERFORD (*Idaho Sta. Bul. 229 (1939), pp. 47, fig. 1*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Fifty-first Annual Report of [Indiana Station], 1938, J. H. SKINNER, H. J. REED, ET AL. (*Indiana Sta. Rpt. 1938, pp. 117, figs. 35*).—The experimental work not previously referred to is mostly noted elsewhere in this issue.

Fifty-first Annual Report of the [Michigan Station], 1938, V. R. GARDNER (*Michigan Sta. Rpt. 1938, pp. 125–136*).—This consists mainly of lists of publications and projects.

Fifty-second Annual Report of [Nebraska Station, 1938], W. W. BURR (*Nebraska Sta. Rpt. [1938], pp. 59*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual summary of publications (*Utah Sta. Cir. 112 (1939), pp. [4]*).—Abstracts of Bulletins 282–288 and Circulars 110 and 111 are given, with lists of reprints.

Agriculture in the twentieth century (*Oxford: Univ. Press, 1939, pp. X + 440, pl. 1, figs. 3*).—This volume of essays was designed for presentation to Sir Daniel Hall, and was planned to cover the more important scientific, technical, and administrative developments during the years of his leadership in British agriculture. The essays are as follows: Agriculture and the Civil Service, by H. E. Dale (pp. 1–20); Agriculture and the State—the Financial and Economic Results of Control, by J. A. Venn (pp. 21–49); Agricultural Conditions and Policies, 1910–38, by A. W. Ashby (pp. 51–86); Agricultural Education in College and County, by J. A. Hanley (pp. 87–121); The Art of Husbandry, by J. A. Scott Watson (pp. 123–135); The Farmer's Business, by C. S. Orwin (pp. 137–162); Soil Science in England, 1894–1938, by E. J. Russell (pp. 163–191); Grassland, by R. G. Stapledon (pp. 193–221); Developments in Plant Breeding, by H. Hunter (pp. 223–260); Outlines of the History of Plant Virus esearch, by R. N. Salaman (pp. 261–289); Plant Protection, by J. C. F. Fryer (pp. 291–307); Landmarks in the Development of Scientific Fruit-Growing, by R. G. Hatton (pp. 309–360); Some Problems of Animal Nutrition, by C. Crowther (pp. 361–395); The Evolution of Milk-Production, by J. Mackintosh (pp. 397–421); and Agriculture and National Health, by J. B. Orr (pp. 423–433).

NOTES

Arkansas University and Station.—Dr. J. W. Reid, assistant professor and assistant in rural economics and sociology, has resigned as of August 31. Recent appointments include Dr. D. F. Eveleth, assistant professor of veterinary research in the Iowa College, as head of the department of bacteriology and veterinary science, beginning September 6; Dr. Warren Gifford as head of the department of animal industry, effective August 21; Mildred Stenswick as instructor in home economics, beginning September 11; and W. H. Wiley as instructor in animal industry, effective September 1.

Colorado College and Station.—Dr. Charles H. Kick, head of the department of animal husbandry during the past academic year and dean of agriculture and director of the station since July 1, died August 27. Dr. I. E. Newsom, vice president of the college and dean of the division of veterinary medicine, has been appointed acting director of the station, and Alvin Kezer, agronomist, acting dean.

Dr. Kick was born in Philadelphia on September 5, 1900, graduating from the Pennsylvania College in 1922 and receiving the M. S. degree from the University of Illinois in 1924 and the Ph. D. degree from the University of Wisconsin in 1932. He had been associated with the animal husbandry work of the Illinois University from 1923 to 1927 and the Ohio Station from 1927 to 1938. During the last 2 years of this period he was located at Reynoldsburg in cooperation with the College of Veterinary Medicine of Ohio State University. His work had been mainly in animal nutrition, especially with poultry and the digestion of cattle.

Iowa College and Station.—Charles E. Rogers, head of the department of journalism in the Kansas College, has been appointed head of the department of technical journalism and editor of the publications of the station and the extension service. The appointment becomes effective in January 1940.

Kentucky University and Station.—Dr. Leonard J. Goss, assistant animal pathologist, has resigned. Recent appointments include R. H. Allen as associate professor and assistant in land economics; Dr. Bennett S. White, Jr., as assistant professor of agricultural economics and assistant in markets and cooperation; Robin M. Williams as instructor and assistant in rural sociology; W. C. Templeton, Jr., as instructor in farm crops; Wendell Binkley as assistant in markets; Dr. Paul F. Macy as assistant chemist; and Dr. Clifford Westerfield as assistant veterinarian.

North Dakota Station.—Dean H. L. Walster of the division of agriculture has been reappointed director of the station, Dr. H. C. Hanson becoming vice director.

Association of Land-Grant Colleges and Universities.—In order to permit of recommendations to the executive committee prior to the opening of the convention on November 15, as is now required by the executive body, special sessions will be held of the various sections on November 14. These sessions will begin at 10 a. m. and will continue through as much of the day as may be deemed necessary.

President J. A. Burruss of the Virginia Polytechnic Institute and president of the association was recently appointed as its representative on the advisory committee of 28 set up by the Secretary of Agriculture to assist in the formulation of policies to deal with the situation brought about by the European war as related to American agricultural economy.

EXPERIMENT STATION RECORD

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THE DEPARTMENT OF AGRICULTURE APPROPRIATION ACT, 1940

In the year 1891 the *Record*, then in its second volume, began an analysis of the annual acts making appropriations for the support of the Federal Department of Agriculture. This analysis has been continued without interruption because of the general interest in the development of the Department and the belief that these acts serve as a convenient index of that development. As a matter of fact, the acts for successive years have seldom been fully comparable without more or less interpretation, and the passage of supplementary legislation has often been a further complication. Nevertheless, on the whole a picture is obtainable which is reasonably accurate and enlightening.

The latest of these acts was signed by President Franklin D. Roosevelt on June 30, 1939, and became effective on the following day. It was extensively modified by reorganization changes and supplementary legislation, the net result of which was to provide a total in appropriations and reappropriations of $1,385,758,620. In the aggregate, this is practically the same as the $1,383,621,893 appropriated for the previous year. In addition, provision was made of $119,599,918 for the restoration of capital of the Commodity Credit Corporation as of March 31, 1939, and the direct appropriations for the Farm Credit Administration were increased from $3,782,880 to $18,741,000.

Both the Commodity Credit Corporation and the Farm Credit Administration had been independent of the Department, but both became associated with it on July 1, 1939, following the passage of the Reorganization Act of 1939 and the promulgation of plans thereunder by the President. Also added to the Department's activities were the Rural Electrification Administration, with a 1940 appropriation of $42,790,000, and the Federal Farm Mortgage Corporation, for which the use of $9,500,000 of the funds of the Corporation was authorized for administrative expenses. On the other hand, the Bureau of Public Roads, for which $191,000,000 was appropriated in the 1940 act, became the Public Roads Administration of the newly established Federal Works Agency. The Bureau of Biological Survey, for which $4,053,691 was appropriated in the 1940 act, was transferred to the

Department of the Interior. The foreign offices of the Foreign Agricultural Service were transferred to the State Department, and the unit retained in the Department of Agriculture was re-named the Office of Foreign Agricultural Relations.

In addition to the interdepartmental changes brought about by Presidential order, several internal readjustments which had been effected during the year were reflected in the act. Prominent among these was the realignment of the economic work of the Department. In the new set-up the Bureau of Agricultural Economics is retained, with an appropriation of $928,000, primarily as an agency for economic research (with an increase of $37,000), but also to serve as the central agency of the Department, in cooperation with operating bureaus, the land-grant institutions, and county planning committees, to formulate coordinated action programs relative to agricultural production, distribution, and land utilization and conservation. There is also constituted, however, as a new administrative unit, the Agricultural Marketing Service, with an appropriation of $6,096,338. The work of this Service includes studies in marketing farm and food products, the market inspection of these products, the market news service, the crop and livestock estimates, and the enforcement of the various regulatory acts relating to marketing. Most of its projects receive small increases in funds over the previous year, and the allotment for the crop and livestock estimates is raised from $642,799 to $747,510.

Another organization change was the transfer to the Bureau of Plant Industry of the Soil Survey and other basic research in soils and the merging of the Bureau of Agricultural Engineering with the Bureau of Chemistry and Soils to constitute the Bureau of Agricultural Chemistry and Engineering. The initial appropriation for this Bureau is $1,379,369. This is a net decrease of $44,800, the largest item in which is a $38,300 curtailment in the fertilizer investigations.

By far the largest allotment appearing in the 1940 agricultural appropriation act is that for the conservation and use of agricultural land resources. The act itself appropriates $429,560,000 and reappropriates $70,000,000 additional for this purpose. It also provides $225,000,000 for parity payments to producers of wheat, cotton, corn, rice, and tobacco; $113,000,000 for the disposal of surplus commodities (in addition to $92,678,812 provided for this purpose by a permanent appropriation); and $47,975,000 (including reappropriations) for payments and administration under the Sugar Act of 1937. The total appropriations and reappropriations under the Farm Tenant Act are increased from $40,923,000 to $49,985,730. The Farm Security Administration receives $160,700,000 in appropriations and reappropriations provided by the Emergency Relief Appropriation Act of 1939, a decrease from $198,000,000.

The Special Research Fund of the Department under the Bankhead-Jones Act (E. S. R., 73, p. 289) is maintained at the $1,400,000 level. For the four regional research laboratories (E. S. R., 80, p. 289) authorized by the Agricultural Adjustment Act of 1938 not to exceed $3,200,000 was provided, and specific authority to conduct research on food products of farm commodities at these laboratories was included in the appropriation act.

Under the Office of Experiment Stations a total of $7,093,485 is granted, of which $6,848,750 represents payments to the States, Hawaii, Alaska, and Puerto Rico for agricultural experiment stations. This is an increase in payments of $307,500 over the previous year, of which $300,000 is under the Bankhead-Jones appropriations, which rise to $2,400,000. For the administrative expenses of the Office, a total of $189,735 (including an allotment of $28,000 from the Special Research Fund) will again be available. The sum of $83,000 is provided for the maintenance of the Federal Experiment Station in Puerto Rico, including an increase of $15,755 for investigations of the economic production of rotenone-bearing insecticidal plants, quinine plants, and similar commodities.

The funds administered by the Extension Service are increased from $18,809,387 to $19,398,447. The amount available for payments to States and Territories in the fiscal year 1940 is $18,470,583 (including the permanent Smith-Lever Act appropriation of $4,701,165), which provides a net increase over 1939 of $533,000. The full authorized increase of $1,000,000 in Bankhead-Jones funds is provided, as well as $203,000 for readjustments of allotments to individual States under an act approved April 24, 1939, but other grants of $670,000 have been eliminated.

The airways weather service and research are promoted by an increase in the appropriations to the Weather Bureau for this purpose from $2,500,000 to $3,500,000. A further increase of $185,000 in the Bureau's allotment for general weather service and research brings its total to $6,172,870, including $250,000 to provide the first unit of a building in Washington, D. C.

An apparent increase from $13,746,752 to $16,663,712 in the funds available for the Bureau of Animal Industry is attributable largely to the allotment of $8,300,000 instead of $5,403,000 for eradicating tuberculosis and Bang's disease. Increases of $13,500, $15,000, and $20,400 in the funds for animal husbandry work, investigations of animal diseases, and the meat inspection are offset in part by a decrease of $28,940 for cattle tick eradication.

The total for the Bureau of Plant Industry shows an increase from $5,110,337 to $5,183,009, distributed among six items, of which the largest are $52,000 for sweetpotato and other fruit and vegetable crops and disease investigations and $25,000 for one-variety cotton work.

These are offset in part by a reduction from $168,457 to $121,622 for soil fertility investigations. The Soil Survey again receives $298,708.

The Forest Service is granted a total of $20,294,466, and in addition $10,000,000 is provided for the construction of forest roads and trails and $300,000 for cooperative farm forestry, the latter being the initial appropriation under the act of May 18, 1937. There is also a deficiency grant of $5,500,000 for New England hurricane damage repair, which is available until June 30, 1940. A new project is the authorization of a Tropical Forest Experiment Station in Puerto Rico, for which $30,000 is granted. There are increases from $11,569,754 to $12,004,000 in the funds for the protection and management of the national forests; from $628,361 to $664,181 to permit of further research in the use of wood in building, including low cost housing; from $121,295 to $149,295 for forest economic studies; and from $2,000,000 to $2,200,000 for forest fire cooperation. A decrease is noted from $648,403 to $613,403 in the funds for forest management studies.

The funds provided in last year's appropriation act for the Bureau of Entomology and Plant Quarantine totaled for that year $5,721,867, but these were further supplemented by two deficiency grants aggregating $4,750,000 for insect pest and plant disease control, which sums were made available until December 31, 1939. The Bureau's appropriation in the new act totals $6,199,809. Most of the allotments are continued unchanged, but among others increases are granted of $460,000 for pink bollworm control and $21,511 for Dutch elm disease eradication, while there is a decrease of $25,000 for barberry eradication.

The remaining work of the Department is provided for much as at present. The Soil Conservation Service receives $23,720,584, an increase of $75,000 for research and demonstration work in the Everglades region of Florida. The Food and Drug Administration is increased from $2,241,138 to $2,741,138, the principal item being an enlargement of $525,000 in the funds for the enforcement of the Food and Drugs Act. The Bureau of Dairy Industry receives an increase of $4,000, and the Library one of $3,800, making their totals $721,405 and $107,970, respectively. The Bureau of Home Economics receives $325,085, which is an increase of $20,000 for additional textiles and clothing investigations. The Commodity Exchange Administration is again granted $623,380; the Office of Information $1,965,910, which includes $1,586,870 for the departmental printing and binding; the Secretary's Office $896,447; the Office of the Solicitor $231,280; and the Beltsville Research Center $85,000.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Selenium in rocks, soils, and plants, A. L. MOXON, O. E. OLSON, and W. V. SEARIGHT (*South Dakota Sta. Tech. Bul. 2 (1939), pp. 94, figs. 27*).—Analyses of several samples of rocks from many of the geological formations indicate that selenium is usually present in the rocks of South Dakota but in most of them only in very small quantities. There are, however, some formations or beds within formations which contain a relatively large amount of the element, and where these formations or beds are exposed selenium poisoning in livestock may occur. The most consistently highly seleniferous formation in South Dakota is the Niobrara, the outcrop of which covers only a very small area within the State. The lower Sharon Springs member of the Pierre formation is also consistently highly seleniferous, but it is resistant to weathering and, therefore, seldom forms soils, and vegetation is seldom found growing on it. The upper Sharon Springs contains enough selenium to be considered dangerous from the standpoint of selenium poisoning. Although the relatively fresh outcrops of the member seldom support much vegetation, soils weather from it, and these soils support the growth of considerable vegetation. For the most part the Virgin Creek member of the Pierre formation is not highly seleniferous, but near the Missouri River in the southern half of the State the uppermost part of the member contains considerable selenium, and highly seleniferous soils have weathered from it. The Interior member of the Pierre formation is highly seleniferous in the area along the Missouri River in the southern half of the State, and in this area it forms seleniferous soils, but its selenium content decreases rapidly toward the northwest.

"Converter" plants were found to play an important part in the production of toxic concentrations of selenium compounds in crop and forage plants, in that the converter plant absorbs selenium compounds not available to other species and, on decaying to form part of the soil humus, leaves the selenium in a form readily taken up by other plants. Experiments with corn showed that selenates were taken up more freely than selenites or selenides. The selenium content of an extract of *Astragalus racemosus* was also readily taken up by corn plants.

Chemical investigations of the rhubarb plant, H. B. VICKERY, G. W. PUCHER, A. J. WAKEMAN, and C. S. LEAVENWORTH (*Connecticut [New Haven] Sta. Bul. 424 (1939), pp. 157, figs. 38*).—The first two of the three parts into which this bulletin is divided deal with separate experiments carried out with leaves collected in 2 successive years from the same farm. The two lots differed somewhat widely in initial composition, and their behavior during culture in water in darkness was correspondingly different. In the experiments of the second year, the conditions of culture were extended to include culture in darkness in glucose solution and culture in light in water, the set of samples cultured in darkness in water serving as a control. The description of these experiments is given in considerable detail.

An interpretation of the data in terms of modern views of plant metabolism is presented, together with still further experimental results, in part 3.

The research here recorded is a part of a general study of the chemistry of the plant cell, work on which has already been noted (E. S. R., 78, pp. 293, 748).

[Contributions of interest to factory technologists and chemists] (*Internatl. Soc. Sugar Cane Technol. Cong. [Baton Rouge, La.] Proc., 6 (1938), pp. 852–1113, figs. 72*).—These papers include Report of Special Committee on Uniformity in Reporting Factory Data, by F. W. Zerban (pp. 852–857); Review of Technical Progress Made in the Philippine Islands During the Past Three to Five Years, by C. W. Waddell (pp. 857–866); Conductimetric Determination of Ash in Sugar House Products, by F. H. C. Kelly and I. G. Newman (pp. 866–874); Graphic Critique of Factory Operations, by E. W. Kopke (pp. 874–880); The Value of Cane Juice as a Yeast Nutrient Medium, by K. Yamafuji and K. Ohtsu (pp. 880–885); A New Method for Determining Reducing Sugar, by K. Yamafuji and T. Yoshida (pp. 886–889); Precision Requirements in Refractometer Design, by J. W. Forrest (pp. 890–895); The Factory Comparison of Different Grades of Lime for Clarification Purposes, by R. R. Follett-Smith (pp. 896–899); A Contribution to Raw Sugar Clarification, by J. G. Davies (pp. 900–910); Automatic pH Control of Secondary Liming in the Fractional Liming and Double Heating Clarification System, by M. Moore (pp. 910–917); Work With Vacuum Pans, by A. L. Webre (pp. 919, 920); Improvements in the Manufacture of Sugar in Mauritius During the Last Four Years, by V. Olivier (pp. 922–924); Utilization of Bagasse, by R. C. Pitcairn (pp. 925–927); The By-Products of the Mauritius Sugar Industry, by R. Avice (pp. 928, 929); Refining Cane Sugar for the American Market, by R. Fortier (pp. 930–934); Studies of Louisiana Raw Sugar, by A. G. Keller (pp. 935–945) (La. State Univ.); New Possibilities of the Two-Boiling System, by A. L. Webre (pp. 945–951); Forced Draft for Bagasse Furnaces, by A. E. Seelig (pp. 952–963); Sucrose Loss in Filter Cake When Bagacillo Is Added as Filter Aid to Settlings, by W. A. Powe (pp. 963–967); Use of Hot Minglers at Central Jaronu, by R. E. Diago (pp. 968–970); Behavior of the Molasses of the Sucreries d'Egypte, by P. Neuville (pp. 971–980); The Keeping Quality of Cane Sugar Molasses, by H. C. P. Geerligs (pp. 980–985); Effect on Factory Cane Juices and Sirups of *Leuconostoc mesenterioides* Isolated From Frost Damaged Louisiana Sugarcane of the 1937 Crop, by M. A. McCalip and H. H. Hall (pp. 986–1004), and The Influence of Sirup Composition on Sugar Quality, by C. A. Fort (pp. 1005–1018) (both U. S. D. A.); New Equipment for Improving the Efficiency of Mills, by E. L. Dennis (pp. 1019–1023); Reduction in Costs by Correct Filtration Procedure and Proper Selection of Filter-aid, by R. W. Schmidt and M. A. Harrison (pp. 1024–1032); The Use of Phosphoric Acid in Cane Sugar Manufacture and Refining, by G. P. Meade (pp. 1032–1038); Recent Improvements in the Sucro-Blanc Process of Refining, by A. P. Fowler (pp. 1039–1043); Present Practice in Raw Sugar Manufacture in Queensland, by E. R. Behne and G. H. Jenkins (pp. 1046–1066); The Relation Between the Composition of Sugar Solutions and Produced Sugar, by P. Honig (pp. 1066–1068); Re-Use of Washed Sugar Liquor Filter Cake in Syrup Filtration and the Use of Vacuum Filters for Recovery of Values From Spent Filter-Aid, by W. J. Nelson (pp. 1069–1071); Electric Drive for Cane Mills, by C. A. Kelsey (pp. 1071–1074); Recent Investigations and Developments in the Processing of Massecuites, by G. E. Stevens (pp. 1074–1093); Viscosity-Supersaturation Relationships of Industrial Sugar Solutions, by L. I. A. Micheli and O. S. de Gyulay (pp. 1094–1107); and Treatment of Low Grade Massecuites, by C. W. Waddell (pp. 1108–1113).

Colorimetric method for the determination of sulfate in cane juice, P. E. Cay and F. E. Hance (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *43* (*1939*), *No. 2, pp. 137–142, pl. 1, fig. 1*).—The proposed colorimetric method utilizes the color formed by sodium rhodizonate and the excess barium chloride which is used to precipitate the sulfate in the sample. The sodium rhodizonate forms a red solution with the excess barium. If there is no excess barium chloride, the solution is yellow. Full manipulative detail, including preparation of permanent color standards (sodium dichromate solutions), is given.

A technic for the determination of vitamin A in milk [trans. title], A. Chevallier and S. Manuel (*Compt. Rend. Soc. Biol.* [*Paris*], *130* (*1939*), *No. 6, pp. 553–555*).—In the method described 12 cc. of 60-percent potassium hydroxide is added to 25 cc. of well-homogenized milk. After standing in an oven at 55° [C.] for 3 days, the mixture is extracted with 40 cc. of peroxide-free ether, decanted, washed 3 or 4 times with 5 cc. of water, and evaporated on a water bath. Ten cc. of the concentrate is then used for the spectrophotometric examination, which shows marked inflection in the region of 3,300–3,200 a. u. Irradiation of the solution causes this inflection to disappear in a short time, and a new curve is obtained, the difference between which and the first measures the quantity of vitamin A initially present in the milk. The test should be made on whole milk, for in separated milk some of the vitamin still remains in the skim milk.

Retaining flavor in canned foods, G. J. Hucker and C. S. Pederson (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 3, pp. 8, 9*).—The authors briefly note an investigation of canning temperatures and cooking periods in which some types of food products, though not all, were adequately sterilized at temperatures "much lower" than those now employed and in shorter cooking periods. The acid fruits were especially adaptable to this less severe processing. Successful preservation of tomato juice in tins filled at 180° F., sealed, and subjected to no further cooking, is mentioned.

Calcium added to canned tomatoes results in firmer product, Z. I. Kertesz (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 3, p. 12, fig. 1*).—Calcium chloride in the proportion of 0.022 oz. of anhydrous $CaCl_2$ per No. 2 tin was found enough to keep canned tomatoes sufficiently firm to come out whole from the tin and to retain their shape. This proportion of calcium chloride had no other effect upon the flavor than that of slightly increasing the salty taste, so that less salt had to be used. It was found also that the firmness of canned mature apples was improved by using calcium chloride as well as salt in the soaking tank. It is noted that this work grew out of a "theoretical research" upon factors affecting the behavior of pectins and the enzymes acting upon them.

SOILS—FERTILIZERS

The soils of Florida, J. R. Henderson (*Florida Sta. Bul. 334* (*1939*), *pp. 67, figs. 5, maps 2*).—The first 17 text pages of this bulletin are given to a general discussion of the characteristics, development, and classification of soils. The remainder of the bulletin takes up factors in the development of Florida soils, their characteristics, distribution, and utilization, and presents some notes on their management and conservation, together with a key for their identification.

[Soil investigations of the New Mexico Station] (*New Mexico Sta. Rpt. 1938, pp. 55, 56*).—Work on effects of irrigation and cropping on soil profiles is briefly noted.

[Soil Survey Reports, 1932 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpts.*], *Ser. 1932, No. 34, pp. 102, figs. 2, maps 2*).—A survey

was made in cooperation with the [N. Y.] Cornell Experiment Station as follows: No. 34, Orleans County, N. Y., R. Wildermuth et al.

[Soil investigations at the Rhode Island Station] (*Rhode Island Sta. Rpt. [1938], pp. 31–36, 44, 45*).—These have included studies on optimum soil nitrate levels, effect of day length and acidity on the assimilation of nitrate and ammonium nitrogen, effect of crops on soil acidity, the relative availability for plants of different compounds of magnesium, growth retardation by chloropicrin in culture solutions, and effect of chloropicrin treatment on nitrification and ammonification in soil.

Erosion and related land use conditions (*U. S. Dept. Agr., [Soil Conserv. Serv.], [White Rock Reservoir Watershed], 1939, pp. 29, pls. 7, fig. 1, maps 2; [Muskingum River Watershed], 1939, pp. 36, pls. 12, fig. 2, maps 4*).—Conservation surveys (similar to those heretofore more fully noted) are reported as follows: On the Watershed of White Rock Reservoir Near Dallas, Texas, by *R. M. Marshall and C. B. Brown; and On the Muskingum River Watershed, by* H. H. Morse.

A chemical study of some soils derived from limestone, L. T. Alexander, H. G. Byers, and G. Edgington (*U. S. Dept. Agr., Tech. Bul. 678 (1939), pp. 27*).—*Chemical and physical studies of 10 profiles of soils derived from parent* material residual from the decomposition of limestone (Frederick, Maury, Dewey, Decatur, Fullerton, Greenville, Lebanon, and 3 Hagerstown profiles) indicated that the gross chemical composition of the soil colloid does not always reflect the zonal and intrazonal group differences between the soils from which they came. Local variations in the soils were apparently caused by variation in the parent rock and relief. Differences between soils derived from similar parent rocks in widely separated localities seemed largely due to climatic differences. The silica : base ratio of the colloid fraction was found to correlate well with productivity except where physical factors were dominant.

Variation in available nutrients in an uncropped surface soil, R. J. Borden (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 43 (1939), No. 2, pp. 133–136, fig. 1*).—An area of about 25 ft. square was maintained in a bare fallow condition for 2 yr., during which time two separate soil sample composites were taken twice each month for rapid analysis, the results being tabulated as pounds of available plant nutrients per acre. The variations from one set of samples to another were sufficient to lead to the conclusion that estimates of the fertilizer requirements of the soil based on soil analysis alone cannot be depended upon for accurate results.

Evaluating annual changes in soil productivity, A. W. Klemme and O. T. Coleman (*Missouri Sta. Bul. 405 (1939), pp. 32, figs. 14*).—Analyses of soil from virgin and cultivated areas where no erosion has occurred indicated that cropping alone caused a decline of about 35 percent of the organic matter and nitrogen. United States census data for 60 yr. show a slight decline in Missouri yields of corn, oats, and hay, while wheat yields have remained about the same. The station experiments show that such improved crop practices as use of commercial fertilizers, bringing in of new land, better cultural methods, and improved varieties should have increased crop yields from 20 to 30 percent. These practices, therefore, have been compensating for the declining soil productivity.

From the yields of the principal crops on the outlying experimental fields where the total nitrogen content of the soil has been ascertained, the annual withdrawal of nitrogen supply of the soil was estimated for the different crops. From the yields of legumes on the outlying experimental fields the nitrogen turn-over provided by them on the soil on which they were grown was estimated. The total organic matter and nitrogen content of a silt loam soil being taken as a

guide to soil productivity and crop yields, it was found that a yield of about 10 bu. of corn per acre can be expected for each 1,000 lb. of total nitrogen in the surface 7 in. of an acre.

"The percent gain or loss of the total nitrogen supply of the surface 7 in. of the soil from different crops, cropping systems, and soil treatments was considered as the productivity index. The percent of the total nitrogen and organic matter lost by sheet erosion when in different crops and cropping systems was taken as the erosion factor. Through the combined use of the productivity and erosion factors it is possible to determine approximately the annual gain or loss in productivity for a field, farm, or county. These productivity indexes and erosion factors provide an approximate measurement of the annual gain or loss in the productivity of the soil under the land use or soil farm management program of the farm."

Effect of organic matter decomposition on the solubility and fixation of phosphorus in alkaline soils, H. F. RHOADES (*Nebraska Sta. Res. Bul. 113 (1939), pp. 23*).—The author studied the effects of the decomposition of organic matter and of the nitrification of ammonium sulfate and of urea on the solubility and fixation of phosphorus by two calcareous and two noncalcareous alkaline soils.

Crop residues and manure had no appreciable effect on the pH of the soils. Both urea and ammonium sulfate caused a lowering of the pH. The nitrification of urea and ammonium sulfate had no appreciable effect on the phosphorus removed from the calcareous soils but caused decided increases for the noncalcareous alkaline soils. Urea accelerated the fixation of applied phosphate. Crop residues increased the soluble phosphorus in all the soils studied. Horse manure increased the soluble phosphorus much more than any of the other materials. In general, the increases were greater for those materials with a higher phosphorus content. The decomposition of sugar beet tops retarded the fixation of applied phosphate. The calcium content of the soil solution was greatly increased by the urea and ammonium sulfate treatments, moderately increased by alfalfa tops, sugar beet tops, and potato tops, and slightly increased by the other organic materials. The phosphorus contents of the soil solutions were not appreciably affected by the addition of urea and ammonium sulfate. The phosphorus content in the soil solution was increased by the addition of organic material.

"The results of these studies indicate that the increases in soluble phosphorus due to applications of crop residues and manure to alkaline soils are largely due to the phosphorus released from the organic materials and not to a solubility of the native soil phosphorus."

[Soil fertility experiments], A. T. WIANCKO ET AL. (*Indiana Sta. Cirs. 242 (1939), pp. 5–8; 243, pp. 1–6; 244, pp. 1–5; 245, pp. 1–3; 246, pp. 1–3; 247, pp. 1–4; 248, pp. 1–5, 6, 7*).—All of these circulars report on a long-time general fertility experiment, and most of them deal with the topics how to treat this kind of land, best time for applying manure, and comparison of various phosphates, nitrogen materials, and liming materials over various periods up to 1938.

[Soil and fertilizer notes] (*Miss. Farm Res. [Mississippi Sta.], 1 (1938), Nos. 2, p. 3; 3, pp. 4, 7, fig. 1; 2 (1939), Nos. 1, pp. 1, 4, 8; 2, pp. 1, 3; 6, pp. 2, 7, fig. 1; 7, pp. 2, 6, 7, fig. 7*).—The following brief articles are included: Vol. 1, No. 2, Good Husbandry for Productive Soils, by E. B. Ferris; No. 3, Poorer Soils Profit From Legumes When Good Crop Can Be Grown, by I. E. Miles, and Complete Fertilizer Needed for East Area of Yazoo-Mississippi Delta, by R. Kuykendall; Vol. 2, No. 1, 1939 Fertilizer Recommendations for Major Farm Crops of Mississippi, and State Soils Are Acid or Becoming Acid, both by C. Dorman;

No. 2, Fertilizer Materials, Formulas, and Methods of Usage Are Clarified, by C. Dorman, and Money Saved by Higher Analysis Fertilization, by R. Cowart; *No. 5, Deer Licks [Saline Soil Spots], by C. Dorman*; *No. 6, Agricultural Areas* of Mississippi, by I. E. Miles; No. 7, Lime and Basic Slag Increase Yields of Soybeans, Vetch, Austrian Peas, Lespedeza, Aid in Improvement of Soil, by W. B. Andrews, and Fertilizer in the Yazoo-Mississippi Delta, by R. Kuykendall.

Influence of potash fertilization upon the production and composition of dry matter, R. J. Borden (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *43* (*1939*), *No. 2, pp. 119–123*).—Small gains from potassium fertilizers in the production of dry matter from eight soils, which are not markedly deficient in available potassium, were significant only when the crop was harvested at optimum development, neither immature nor overmature. Although potassium fertilizers increased both the percentage and the total quantity of this mineral found in the dry matter at harvest, there was no correlation between potassium composition and final dry weights. The percentage of potassium in the total dry matter of the leaves and stems decreased as the age of harvest was delayed, but in the roots there was apparently a return of potassium when the plants passed maturity. The total amount of the potassium recovered in the total dry matter harvested decreased with the age at harvest. Such effects of potassium fertilizers are likely to introduce a complication into any attempt to interpret potassium composition figures.

Timely fertilizer facts for North Carolina farmers, C. B. Williams (*North Carolina Sta. Agron. Inform. Cir. 118* (*1939*), *pp.* [*1*]+*4*).—This circular is concerned with the desirability of including such organic nitrogen sources as cottonseed or soybean meal as well as nitrates or ammonium salts in fertilizer mixtures, and of purchasing fertilizers on the basis of quality and specific use.

AGRICULTURAL BOTANY

Edible wild plants, O. P. Medsger (*New York: Macmillan Co., 1939, pp. XV+323,* [*pls. 16, figs. 80*]).—The basis of this book is said to rest on data relative to edible plants collected over many years from books, published reports, papers, experiences of people, and wherever information on the subject could be obtained, including first-hand observation and experiment wherever possible. The manual does not include all the edible plants in the United States, but it is hoped that it will prove useful as a basis for future studies. Included in the work are edible fruits, nuts, seeds and seed pods, salad plants and potherbs, roots and tubers, beverage and flavoring plants, sugars and gums, and mushrooms. A general and four regional indexes are provided. There is an introduction by E. T. Seton.

Application of fine grain processing and condenser illumination enlarging to photomicrography, F. P. McWhorter (Oreg. Expt. Sta. and U. S. D. A.). (*Stain Technol., 14* (*1939*), *No. 3, pp. 87–96, figs. 4*).—Photomicrographs requiring great resolution are ordinarily made by means of long initial projection, involving the use of heavy, often cumbersome apparatus designed to eliminate vibration. The author evaluated the possibility of using an intermediate projection distance equal to or greater than 160 mm., which is considered the minimum for efficiency, and recording the initial negative image in very fine grain. Then, by critical enlarging, a positive image is obtained which closely approaches the resolution obtainable by the finest long projection equipment. The initial projection permits eliminating the vibration difficulties attending long exposures so that critical printing at magnifications above 2,000× will consistently give good results, provided fine grain technic is mastered by the operator.

A low cost chamber for phytohormone tests, G. S. AVERY, JR., H. B. CREIGHTON, and C. W. HOCK (*Amer. Jour. Bot., 26 (1939), No. 6, pp. 360–365, figs. 5*).—The chamber described and illustrated in detail is said to permit perfect humidity control if kept in a temperature-controlled darkroom, thus obviating expensive humidity control equipment and maintenance expense. The chamber is large enough to accommodate 8–9 racks of oat seedlings (12 plants each) in water culture, and several control chambers may be housed in one darkroom. Schedules are given for the "deseeded" and "standard" *Avena* methods as used in comparative tests in this control chamber and in the usual constant-temperature constant-humidity test room, results of such tests on over 100 doz. plants being included.

Dioxan dehydration for paraffin embedded fucus slides, A. O. SIMONDS. (Colo. State Col.). (*Stain Technol., 14 (1939), No. 3, pp. 101, 102, fig. 1*).—It is claimed that the usual difficulties can be overcome and excellent paraffin preparations made by the slow dioxan method and staining with fast green F. C. F. and safranin, procedure for which is given in detail.

Improvements in the permanent root tip squash technic, B. B. HILLARY (*Stain Technol., 14 (1939), No. 3, pp. 97–99*).—Supplementary notes on the technic previously described (E. S. R., 80, p. 315), dealing with corn sirup and dioxan as mounting media.

A permanent transferable culture-tube label, D. J. BLAISDELL. (U. S. D. A.). (*Phytopathology, 29 (1939), No. 8, pp. 761, 762, fig. 1*).—As illustrated this tin-backed label is a split cylinder 1.25 in. long by 2 in. in circumference. A metal edge with 45° beveled corners is folded outward over the face of the cardboard. The label slips easily over the edges of tubes of various sizes, gripping them tightly.

The present members of the Commission on Standardization of Biological Stains (*Stain Technol., 14 (1939), No. 3, pp. 84–86*).—A general statement on the commission, with list of present active members.

Progress in the standardization of stains, H. J. CONN (*Stain Technol., 14 (1939), No. 3, pp. 81–83*).—A summary of progress and financial statement of the Stain Commission.

The use of Bismarck brown Y in some new stain schedules, G. W. BLAYDES. (Ohio State Univ.). (*Stain Technol., 14 (1939), No. 3, pp. 105–110*).—Schedules are presented for stems and roots, middle lamellae in wood, white potato tuber and wheat grain sections, and *Tradescantia zebrina* epidermis.

The biology of bacteria; An introduction to general microbiology, A. T. HENRICI (*Boston and London: D. C. Heath & Co., [1939], 2. ed., pp. XIII+494, [pl. 1], figs. 112*).—A revision of the work previously noted (E. S. R., 73, p. 844) to which two new chapters have been added, and the nomenclature and classification of bacteria have been changed to conform with the fifth edition of Bergey's Manual (E. S. R., 81, p. 489).

The apparent oxidation-reduction potentials of bright platinum electrodes in synthetic media cultures of bacteria, W. E. WARD (*Jour. Bact., 36 (1938), No. 4, pp. 337–355, figs. 6*).—This study indicates that a number of hitherto neglected factors (controlling O_2 accessibility to the medium, zone effects from poisoning the electrodes by bacteria or gas bubbles, and type of electrode used in poorly poised media in presence of air) are important in measuring the apparent redox potentials in bacterial cultures, and that the accuracy of the results is greater with broth than with synthetic medium cultures—*Escherichia coli* being the test organism.

Resistance of non-spore-forming bacteria to heat, P. R. BEAMER and F. W. TANNER. (Univ. Ill.). (*Zentbl. Bakt. [etc.], 2. Abt., 100 (1939), No. 4–8, pp.*

81–98, figs. 6).—The absolute thermal death times were determined for *Staphylococcus aureus* and five species of the typhoid-paratyphoid group in broth at pH 7.05. The time required was greatly reduced on heat exposures in broth at pH 3.65. Heating at 60° C. for 8.9 min. in acid fruit juices was sufficient to kill all but the first of these bacteria, which required 18.8 min. The order of death in these nonsporiferous bacteria appeared to be logarithmic. A bibliography of two pages is included.

Heat sterilized reducing sugars and their effects on the thermal resistance of bacteria, J. C. Baumgartner (*Jour. Bact., 36 (1938), No. 4, pp. 369–382*).—Autoclaving reducing sugar solutions at 112° C. for 15 min. or steaming for 30 min. on 3 successive days resulted in forming a material directly toxic to *Escherichia coli* at 54° and capable of delaying its growth at 37°, but this toxic material was not formed when buffered or broth solutions of these sugars were sterilized by filtration. Filter-sterilized glucose, galactose, lactose, maltose, sucrose, mannitol, and glycerol at 0.5 M concentration in buffer or broth all protected *E. coli* against thermal destruction.

Heat resistance studies on selected yeasts, P. R. Beamer and F. W. Tanner. (Univ. Ill.). (*Zentbl. Bakt.* [etc.], *2 Abt., 100 (1939), No. 9–13, pp. 202–211, figs. 5*).—Thermal death times were determined for *Debaryomyces globosus, Monilia candida, Saccharomyces ellipsoideus, Torula monosa,* and *Willia anomala.* Except for *M. candida,* the time required to kill these organisms was slightly reduced when suspended in acid broth at pH 3.8. In general, the curves obtained in grape juice at pH 2.6 were similar. The order of death in the five yeasts studied was apparently logarithmic. A bibliography is included.

The mycorrhizal habit in crop plants, with a reference to cotton, M. C. Rayner (*Empire Cotton Growing Rev., 16 (1939), No. 3, pp. 171–179*).—A brief review of existing knowledge regarding mycorhizal types and their relationships with various types of plants and various soil constituents. The types associated with crop plants, such as cotton, are discussed. The need is pointed out for more extensive investigations on the significance of mycorhizas in agriculture, particularly in the study of soil factors likely to promote healthy growth and maximum resistance to disease.

The relation of specificity of orchid mycorrhizal fungi to the problem of symbiosis, J. T. Curtis. (Univ. Wis.). (*Amer. Jour. Bot., 26 (1939), No. 6, pp. 390–399, figs. 9*).—From isolations of mycorhizas from 23 orchid species collected in various habitats in the United States and Mexico, 10 *Rhizoctonia* species (2 new) were obtained. No evidence of specificity was found, but there appeared to be a correlation of fungus species with ecological habitat, though a few occurred under a wide variety of conditions. The results of symbiotic germination tests supported the theory of nonspecificity, since the fungi isolated from an orchid were in most cases unable to induce germination of seed of that orchid. From all the evidence at hand it is concluded that the symbiotic relationship is one of parasite and host, with the orchid deriving no benefit from the fungus in its roots.

Problems of structure, growth, and evolution in the shoot apex of seed plants, A. S. Foster. (Univ. Calif.). (*Bot. Rev., 5 (1939), No. 8, pp. 454–470*).—A review and theoretical discussion, with 66 references.

Structure and growth of the shoot apex of Cycas revoluta, A. S. Foster. (Univ. Calif.). (*Amer. Jour. Bot., 26 (1939), No. 6, pp. 372–385, pl. 1, figs. 13*).

The point of origin of the blossom-inducing stimulus, R. H. Roberts and B. E. Struckmeyer. (Wis. Expt. Sta.). (*Science, 90 (1939), No. 2323, p. 16*).—"The variable responses to grafting and to donor branches depending upon the flowering habit of the species and the effects of a 'temperature girdle' and banding

in causing blossoming indicate that the stem of the plant plays a part in the appearance of blossoms as well as does a leaf-formed hormonelike substance."

Development of megagametophyte in Erythronium albidum, D. C. COOPER. (Wis. Expt. Sta.). (*Bot. Gaz., 100 (1939), No. 4, pp. 862–867, figs. 16*).—This is a cytological and embryological study, with 14 references.

Phloem of white pine and other coniferous species, L. R. ABBE and A. S. CRAFTS. (Univs. Minn. and Calif.). (*Bot. Gaz., 100 (1939), No. 4, pp. 695–722, figs. 47*).—Cambium division in white pine is said to start in Massachusetts as early as February in some years, and to be rapid during May, while phloem differentiation may lag until late summer or early fall and daughter cells may remain in various stages of maturity through the winter. The structure and development of the sieve tubes were studied in detail and are described. White pine phloem contains no fibers, and secondary wall thickening occurs in the sieve tubes. Other coniferous genera have phloem fibers, and secondary wall thickening is confined to these elements, which are lignified. Protoplasmic connections in the white pine sieve areas are slender, solid, and fibroid in structure throughout the functioning period, and those of redwood are even more slender. The picture of the functioning of sieve tubes in conifers developed in this study is said to offer little support to theories of phloem transport requiring protoplasmic streaming or a high activity state in the mature sieve tube cytoplasm. There are 22 references.

Relation between chromosome number and stomata in Coffea, C. M. FRANCO (*Bot. Gaz., 100 (1939), No. 4, pp. 817–827, figs. 2*).—The number of stomata was found to decrease inversely with the chromosome number, and size of leaf had no influence on stomatal number. The area of stomatal openings varied with the species and directly with the number of chromosomes. In general, the subsidiary cells contained a large oil drop. In some varieties, especially those of the *C. excelsa* group, green pigmented granules, like chloroplasts, were found in cells of the lower epidermis.

Photoperiodic responses of dill, a very sensitive long day plant, K. C. HAMNER and A. W. NAYLOR. (U. S. D. A. et al.). (*Bot. Gaz., 100 (1939), No. 4, pp. 853–861, figs. 3*).—Of the seedlings from commercial dill seed used, ±2 percent flowered soon after germination if grown under 9-hr. photoperiods, while the rest continued as rosettes for 11 mo. at the same photoperiod. Vegetative plants transferred from short to long photoperiods flowered after exposure to as few as four long photoperiods. When vegetative plants maintained on short photoperiods were transferred to continuous light for a period up to a 132-hr. total and then returned to short photoperiods, the subsequent rate of stem elongation was roughly proportional to the number of hours under continuous light. The critical photoperiod under ordinary greenhouse conditions was 11–14 hr. Exposure of a single leaf to long photoperiod, with the rest of the plant on short photoperiod, proved sufficient to induce the whole plant to flower.

The effect of temperature on the photoperiodic response of spinach, J. E. KNOTT. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 554*).—An abstract.

The effects of ultraviolet radiation on spores of the fungus Aspergillus niger, P. A. ZAHL, L. R. KOLLER, and C. P. HASKINS (*Jour. Gen. Physiol., 22 (1939), No. 6, pp. 689–698, figs. 5*).—The survival ratio was measured as a function of total incident energy for wavelengths of 2,537, 3,022, 3,129, and 3,650 A. U. The effect of humidity on killing the spores by ultraviolet radiation proved negligible. A delay in germination from irradiation was found. The Bunsen-Roscoe reciprocity law was found to hold within the limits of the radiation intensities studied. Certain induced morphological changes were noted. There are 23

Carbohydrate transformations in leaf blades, with special reference to sucrose synthesis, O. A. LEONARD. (Miss. Expt. Sta.). (*Amer. Jour. Bot.*, *26* (*1939*), *No. 7, pp. 475–484, figs. 4*).—By supplying corn leaf blades with 6 percent glucose, the sucrose increased markedly during the 26-hr. feeding period, while glucose and fructose increased only slightly. Glucose, fructose, sucrose, maltose, and lactose solutions fed to sorghum and cotton leaf blades resulted in abundant accumulation of sucrose. Galactose and cellobiose resulted in a small increase of sucrose in sorghum. Cellobiose but not galactose resulted in some sucrose synthesis in cotton. There was no synthesis from *d*-mannose, *l*-xylose, *l*-arabinose, *d*-sorbitol, *d*-manitol, or *d*-dulcitol. Sorghum leaf blades fed glucose in CO_2 or N lost sucrose. Cabbage blades left in N lost by hydrolysis all their initial sucrose. Indoleacetic acid, neutralized with NaOH, at concentrations of 0.1 percent or higher prevented synthesis of sucrose from glucose, but not its hydrolysis. Various strengths of NaCN or KCN, KSCN, ethyl ether fumes, or invertase had little effect on sucrose synthesis. Drying corn leaf blades resulted in a slight increase in sucrose and fructose. Cabbage blades on drying synthesized large amounts of sucrose from the reducing sugars, this continuing until the blades had a moisture content of 8 percent but being prevented by heating to 72° C. Sucrose synthesis from glucose or fructose decreased with senescence in cotton blades, and it was synthesized less readily at 8° than at 30°–50°. Sucrose synthesis is said to be an anabolic process requiring energy, which is probably derived from certain stages in aerobic respiration. Active invertase is apparently not involved in this process.

The third study of water and cane ripening, C. E. HARTT (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *43* (*1939*), *No. 2, pp. 145–158, figs. 8*).—In continuation of this series (E. S. R., 76, p. 605) the conclusions of the earlier studies were confirmed. Ratoons of plants used in the preceding study were used, and it was found that plants in soil at or below the wilting point may carry on photosynthesis, but the sugar made is very much less than under an adequate water supply. The sugar made under such conditions is stored rather than used, the result being a higher percentage of cane sugar in the dry-leaf cane. This gain in sucrose is said to be of physiological interest but probably not of economic importance since it is not all extracted in the juice. Small changes in moisture content of green-leaf cane affected the equilibrium between the simple sugars and sucrose. The sugar content of the dry-leaf cane was not static but was affected by such factors as time of day, water supply, and removal of plants from field to greenhouse.

Vitamins and the germination of pollen grains and fungus spores, W. C. COOPER. (U. S. D. A.). (*Bot. Gaz.*, *100* (*1939*), *No. 4, pp. 844–852, figs. 2*).—Lactoflavin (natural product) and ascorbic acid both proved highly effective in reducing germination of papaya pollen. Synthetic lactoflavin was only about half as effective as the natural product, which was found to contain boron, and this in turn induced pollen germination. It is thus concluded that natural lactoflavin may produce a combined effect. Nicotinic acid, indole-3-acetic acid, and the hydrochlorides of several amino acids were slightly active in inducing pollen germination, but apparently through a pH effect. Thiamin, nicotinic acid, ascorbic acid, carotene, lactoflavin, and a number of other substances induced germination of *Colletotrichum gloeosporioides* spores on corn meal agar. Only lactoflavin had this effect on oatmeal agar, but here the synthetic preparation was as active as the natural product. Amino acids induced germination in *Penicillium italicum* spores, while addition of lactoflavin to the amino acids materially inhibited it.

Vitamin B_1 in relation to meristematic activity of isolated pea roots, F. T. ADDICOTT (*Bot. Gaz., 100 (1939), No. 4, pp. 836–843, figs. 11*).—"The action of vitamin B_1 as a growth hormone of roots is through an effect on meristematic activity rather than on cell elongation, which is the primary effect of the auxins. Cell elongation, differentiation, and maturation proceeded normally in the roots to which vitamin B_1 was not supplied, as far as could be observed, even though meristematic activity was greatly reduced."

Transplantation experiments with peas, II, H. E. HAYWARD and F. W. WENT. (U. S. D. A. et al.). (*Bot. Gaz., 100 (1939), No. 4, pp. 788–801, figs. 4*).—Using a technic previously described (E. S. R., 79, p. 314), the anatomy and histology of the graft union of etiolated pea stems were studied at 5 and 9 days after grafting. In grafts growing very rapidly at first, very good approximation between the original vascular bundles of stock and scion were found. When approximation was poor the grafts grew slowly to begin with. In those which ultimately took, good development of new vascular connections between stock and scion was found, but little or none in unsuccessful grafts. Other tests indicated that only the initial growth rate and the period before the scion reaches its maximum growth rate are affected by whether the initial vascular approximation was good or poor. Thus in peas the ultimate growth of the scion is not affected by the type of grafting or the graft union.

The effect of various compounds upon straight growth of the Avena coleoptile, G. S. AVERY, JR., and G. B. SARGENT (*Amer. Jour. Bot., 26 (1939), No. 7, pp. 548–555, figs. 2*).—In testing for ability to stimulate straight and curved growth of *Avena* coleoptiles, 180 compounds of widely different molecular structure were used, aliphatic, aromatic, and heterocyclic compounds and some of their derivatives being included. At the dilutions used, 37 stimulated growth, 50 inhibited it, and 93 had no apparent effect or gave inconsistent results. Only 10 of the active compounds, all previously well known, gave a clear-cut *Avena* curvature response.

The influence of certain nutrient conditions on catalase activity of apple seedlings, A. J. LOUSTALOT. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 239–242*).—In the experiments reported a deficiency of any of the three major elements tended to reduce catalase activity. While K and P deficiencies sooner or later depressed catalase activity, neither seemed to have as potent an influence as N. Catalase activity seems to be easily influenced by factors affecting the nutritive or physiological condition of the tissues. These preliminary results are suggestive, but more work is believed to be needed concerning the use of this enzyme as an indicator.

Effect of calcium deficiency on respiration of etiolated seedlings, W. R. MULLISON (*Bot. Gaz., 100 (1939), No. 4, pp. 828–835*).—The effect of calcium deficiency on the respiratory rate of tops v. roots of etiolated seedlings of pea, squash, and corn, representing three chemical types of seed, was studied. Total respiration under plus and minus Ca nutrition was highest in corn, least in pea, and intermediate in squash, in all cases being less in the minus than in the plus Ca plants. Ca deficiency was most noticeable in the greatly lowered respiration of the minus Ca as compared with the plus Ca tops. Ca deficiency lowered the respiration of the pea and squash roots, but increased it in the corn roots. Roots of pea and corn respired more than twice as much as did their tops, while in squash it was nearly equal. There are 11 references.

Carbohydrate metabolism in relation to boron nutrition, R. H. WHITE-STEVENS. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 537–543*).—From the results reported and the manifold similar findings of others

(64 references) it appears that at least a tentative theory can be adduced for preliminary consideration. The fact that in boron-deficient plants carbohydrates are also lacking in meristem and root suggests that failure to function is due to lack of adequate energy, supplied normally by respiration of carbohydrates. This applies particularly to roots, where plenty of available energy is required to effect absorption of soil minerals against an osmotic and diffusion gradient, in defiance of the Donnan equilibrium. This slowing up of physiological function is apparently followed by an actual respiration collapse within the cells, resulting from a lapse in the carbohydrate supply.

Boron as a plant nutrient: A bibliography of literature published and reviewed, July 1938 to December 1938, inclusive (with index), D. H. JAMESON (*Washington, D. C.: Amer. Potash Inst., Inc., 1939, Sup. 1, pp. [2]+40+VI*).—Additions to the bibliography previously noted (E. S. R., 80, p. 459).

Leaf growth factors.—II, The activity of pure substances in leaf growth, D. M. BONNER and A. J. HAAGEN-SMIT (*Natl. Acad. Sci. Proc., 25 (1939), No. 4, pp. 184–188, fig. 1*).—Studies of the activities of pure substances in the leaf test (described) indicated that one general class of compounds apparently possesses activity, viz, the purines, with adenine having the highest activity of any tested. It is emphasized that factors other than adenine or any single purine are involved in leaf growth, so that it is not surprising that the growth of etiolated pea seedling leaves was not very great. By increasing the growth rate of the leaves under normal conditions to an extent shown by the adenine leaf test, the other necessary factors will be formed in greater amount, resulting in further increased growth rate of the leaves. This increased leaf surface in turn would indirectly cause increased stem and root growth.

Production of growth substance by bacteria in media containing specific organic and inorganic nitrogenous compounds, P. R. BURKHOLDER. (Univ. Mo.). (*Amer. Jour. Bot., 26 (1939), No. 6, pp. 422–428, fig. 1*).—Substances inducing *Avena* coleoptile growth curvatures were found in cultures of *Aerobacter aerogenes* and *Escherichia coli* grown on glycerol-mineral salts-agar in which the sole nitrogen source was KNO_3, NH_4Cl, or any one of 17 amino acids. Uninoculated media remained inactive, except for tryptophane agar which showed some activity after autoclave sterilization. It is deemed probable that different substances having the physiological properties of auxins may be synthesized by micro-organisms in ways other than by the well-known conversion of tryptophane.

A new growth substance, β-naphthoxyacetic acid, S. C. BAUSOR (*Amer. Jour. Bot., 26 (1939), No. 6, pp. 415–418*).—The properties of this acid are described, and its synthesis and tests of its activity at various concentrations in lanolin paste on intact stems and leaves of *Ocimum basilicum*, *Mimosa pudica*, *Eranthemum nervosum*, and *Lycopersicum esculentum* are detailed. Sodium and potassium β-naphthoxyacetate also proved to be active.

Physiological differentiation in Astragalus with reference to selenium, S. F. and H. M. TRELEASE (*Amer. Jour. Bot., 26 (1939), No. 7, pp. 530–535, figs. 6*).—*A. racemosus* in solution and sand cultures was greatly stimulated by Se as selenite at 0.33–9 p. p. m., confirming earlier tests (E. S. R., 79, p. 174) in suggesting that Se may be an essential microtrophic element for this species. On the other hand, *A. crassicarpus* was not stimulated but was poisoned by a selenite concentration as low as 0.33 p. p. m. *A. racemosus*, having the higher tolerance, was able to accumulate correspondingly higher concentrations of Se from solutions of selenite. Greenhouse tests of growth in artificial media confirmed field observations in showing a physiological differentiation of *Astragalus* species into two groups, viz, (1) those seeming to require Se for development and so serving as indicators of seleniferous soil areas, and (2) those not utilizing Se.

Effect of sulphur dioxide on vegetation (*Ottawa: Natl. Res. Council Canada, 1939, pp. XI+447, pls. [57], figs. [55]*).—The work here described was originated in 1929 and carried on almost continuously for more than 8 yr. The results are set forth in the following scientific papers prepared for the Associate Committee on Trail Smelter Smoke: Sulphur Dioxide in the Atmosphere of Industrial Areas, by M. Katz (pp. 14–50); Symptoms of Injury on Forest and Crop Plants, by M. Katz, G. A. Ledingham, and A. W. McCallum (pp. 51–103); The Sulphur Content of Trees and Shrubs in Relation to Sulphur Dioxide in the Atmosphere, by M. Katz and A. W. McCallum (pp. 104–130); The Hydrogen Ion Concentration, Base Exchange Capacity, and Sulphate Content of Soils (pp. 131–164) and Hydrogen Ion Concentration and Sulphate Content of Water Supplies (pp. 165–173), both by M. Katz, F. A. Wyatt, and H. J. Atkinson; The Effect of Sulphur Dioxide on the Diameter Increment of Conifers, by F. E. Lathe and A. W. McCallum (pp. 174–206); Description of Plots and Apparatus Used in Experimental Investigations, by M. Katz, A. W. McCallum, G. A. Ledingham, and A. E. Harris (pp. 207–217); Fumigation Experiments on Conifers in Their Natural Habitat (pp. 218–243) and Fumigation Experiments on Transplanted Conifers (pp. 244–261), both by M. Katz and A. W. McCallum; Effect of Environmental Factors on the Susceptibility of Barley and Alfalfa to Sulphur Dioxide (pp. 262–297), The Stomatal Behavior of Fumigated Alfalfa (pp. 298–331), and Experiments on Yield of Barley and Alfalfa (pp. 332–368), all by M. Katz and G. A. Ledingham; Effect of Fumigation on Some Chemical Constituents of Barley, Wheat, and Alfalfa, by M. Katz and D. S. Pasternack (pp. 369–392); and Carbon Dioxide Assimilation and Respiration of Alfalfa Under Influence of Sulphur Dioxide, by M. Katz, G. A. Ledingham, and A. E. Harris (pp. 393–428); with an introduction (pp. 1–13) and a summary (pp. 429–447), by M. Katz and F. E. Lathe.

A case of correlative growth inhibition in plants, F. W. WENT (*Amer. Jour. Bot., 26 (1939), No. 7, pp. 505–512, figs. 2*).—Occasionally after applying high concentrations of indoleacetic acid, but regularly with phenylacetic, cyclohexaneacetic, or γ-phenylbutyric acids, growth inhibition of the lower zones of an *Avena* coleoptile occurs, demonstrated by direct growth measurements or more easily by unilateral application of the substances to the cut surface of decapitated coleoptiles, when they show positive curvatures within 2½ hr. after application. This inhibition is an indirect effect of these substances, observable only in intact or decapitated plants. It is shown that the inhibition is due to removal of other growth factors from the zone of inhibition, which are then accumulated near the place of application of the active substance. Thus the effects of substances like phenylacetic acid on growth are due to a dual action, viz, they redistribute other growth factors, and then react with those other factors to give cell elongation. Some substances (cyclohexaneacetic and γ-phenylbutyric acids) possess only the property of redistributing other growth factors without directly affecting cell elongation. In one case, dibenzoyl peroxide, tests indicated that the growth inhibition caused by it was probably due to its effect on the food factor.

The inhibition of root growth by auxins, J. BONNER and J. B. KOEPFLI (*Amer. Jour. Bot., 26 (1939), No. 7, pp. 557–566, figs. 2*).—Through comparisons of 21 analogs of indoleacetic acid, it is shown that the chemical specificity of the auxin inhibition of root growth is closely similar to the chemical specificity for auxin promotion of stem and coleoptile growth, since the substances relatively highly active in the *Avena* and pea tests are also highly active in inhibiting root growth while those little active in promoting stem growth are also little active

in inhibiting root growth. The relative activities in root inhibition of the 21 auxin analogs studied were similar to but not identical with relative activities of the same substances on stem growth. Indoleacetic acid was more active in inhibiting root growth in media at pH 4 than at higher alkalinities. The relation of pH to auxin activity thus resembles the known relation between pH and auxin promotion of stem growth. It is shown that the inhibitory effect of auxin on root growth cannot be offset significantly by supplying the root with large excesses of the materials needed for root growth. In root inhibition the auxin thus seems to act directly on the root cells rather than on the mobilization or transport of other growth substances.

GENETICS

Breeding of resistant races of cultivated plants, T. Roemer, W. H. Fuchs, and K. Isenbeck (*Die Züchtung resistenter Rassen der Kulturpflanzen. Berlin: Paul Parey, 1938, pp. [8]+427, pls. 2, figs. [46]*).—This monograph discusses the necessity for such breeding, the biological bases and types of resistance, its inheritance, methods of breeding for resistance, and applications to specific diseases (pp. 125–419). Literature references for the various sections and a general bibliography are provided.

Inheritance studies in the interspecific cross Solanum demissum Lindl. × S. tuberosum L., C. L. Becker. (Minn. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 1, pp. 23–39*).—The inheritance of several characters was studied in *S. demissum*×*S. tuberosum*. *S. demissum* is a small, prostrate, late-maturing species with narrow cotyledons, small leaves, long stolons, many small tubers, and 72 chromosomes. *S. tuberosum* is a large, erect, early maturing, frost-tender selection with wide cotyledons, medium-sized leaves, short stolons, many medium-sized tubers, and 48 chromosomes.

The 60-chromosome hybrids between these species showed considerable irregularity in meiosis, nonoriented and lagging chromosomes being usual. Three of 15 plants raised were fertile enough to produce F_2 families, one of which was practically identical with *S. demissum* in morphological characters and was uniform. The other two F_2 families approached *S. tuberosum* in morphological characters and were variable. Chromosome counts in 15 of the plants of 1 family ranged from 48 to 58. In cotyledon measurements, stem diameter, heat injury, maturity, frost injury, stolon length, number of tubers, and weight of the largest tuber, these F_2 families ranged from the extremes of the 2 original parents, with the means falling halfway between the parent means. Height of mature plants and internode length of the F_2 families resembled *S. demissum* more, while the weight of the crop was similar to that of *S. tuberosum*. Terminal leaflets and mature leaves were larger than those of either parent.

The induction of polyploidy in Nicotiana species and species hybrids by treatment with colchicine, H. H. Smith. (U. S. D. A.). (*Jour. Hered., 30 (1939), No. 7, pp. 290–306, figs. 10*).—A number of *Nicotiana* species and species hybrids were subjected to meristem treatments with 0.4 percent colchicine and seed treatments with 0.2, 0.4, and 0.8 percent colchicine, and polyploid forms were obtained. Autotetraploids of *N. rustica*, *N. tabacum*, and *N. glauca* were characterized by smaller plant habit, smaller and thicker leaves with larger stomata, larger pollen, and increased pollen sterility compared to the diploids. Polyploids of *N. rustica* and *N. tabacum* had larger seed than the diploids. Allotetraploids of the sterile F_1s (*N. tabacum*×*N. glauca*) and (*N. tabacum*× *N. sylvestris*) were fertile, had wider and thicker leaves with larger stomata, and were similar to the undoubled forms in growth habit. Allotetraploids of the

dwarf hybrid, *N. glutinosa* × *N. glauca*, showed a marked increase in plant vigor, leaf size, and pollen fertility over the F_1. Hyperpolyploids, obtained from doubling chromosomes of some *N. rustica* × *N. tabacum* hybrid segregants, differed from sister plants in smaller plant habit, smaller and thicker leaves with larger stomata, and increased pollen fertility. Seed and polyploid offspring were obtained from *N. rustica*, *N. tabacum*, *N. rustica* × *N. tabacum* hybrids, *N. tabacum* × *N. glauca*, and *N. tabacum* × *N. sylvestris*.

Barley correlation values from six States, comparing chemical values, J. C. Ireland and H. O. Graumann. (Okla. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 3, pp. 361–365*).—The multiple correlation data of hydrolyzed solids, total nitrogen, catalase, diastase, and weight per 1,000 kernels are presented for barley varieties from six States. The coefficient of multiple correlation was of doubtful significance. Correlations of 1,000-kernel weights with total nitrogen and diastase estimations were generally negative.

Sex intergrades in dioecious maize, D. F. Jones. (Conn. [New Haven] Expt. Sta.). (*Amer. Jour. Bot., 26 (1939), No. 6, pp. 412–415*).—Three families of dioecious corn originating from a combination of known mutant types and propagated for nine generations each produced some individuals with a varying degree of male characteristics in the female plants and female characteristics in the male plants. The families differed in the number and character of these sex-intergrades and responded to selection. Sex expression in this material was relatively uninfluenced by the normally fluctuating environment and appeared to be governed by internal factors capable of segregation and recombination.

[Papers on genetics, reproduction, and lactation in dairy cattle] (*Jour. Dairy Sci., 22 (1939), No. 6, pp. 436, 437, 458, 459, 466–471, 475, 476, 478, 479, 488*).—Brief abstracts are given of the following papers on these subjects presented at the 1939 meeting of the American Dairy Science Association: Recent Advances in the Endocrinology of Milk Secretion, by C. W. Turner (pp. 436, 437), and Artificial Insemination of Dairy Cows, by H. A. Herman and A. C. Ragsdale (pp. 466, 467) (both Mo. Expt. Sta.); Anatomical and Physiological Changes in the Pituitary Gland in Vitamin A Deficiency, by T. S. Sutton (pp. 458, 459) (Ohio State Univ.); The Inheritance of the Condition for a White Head in Holstein-Friesian Cattle, by L. O. Gilmore, W. E. Petersen, and J. B. Fitch (pp. 467, 468) (Univ. Minn.); The Inheritance of Fertility in Dairy Cattle, by A. Spielman and I. R. Jones (p. 468) (Oreg. State Col.); Analyses of Dairy Herd Breeding Records, by S. W. Mead and W. M. Regan (pp. 468, 469) (Univ. Calif.); Increasing Production in Institutional Herds, by A. L. Beam, C. S. McLearen, and A. A. Borland (pp. 469–471) (Pa. State Col.); Progress and Prospects of Organized Artificial Insemination of Dairy Cattle, by E. J. Perry (pp. 475, 476), and Influence of Disease in Dairy Cattle Breeding Programs, by G. E. Taylor (pp. 478, 479) (both Rutgers Univ.); and The Relation of the Posterior Hypophysis in the Maintenance of Lactation in Hypophysectomized Rats, by E. T. Gomez (p. 488) (U. S. D. A.).

Experiments in breeding Holstein-Friesian cattle for milk- and butterfat-producing ability, and an analysis of the foundation cows and of the first outbred generation, M. H. Fohrman and R. R. Graves (*U. S. Dept. Agr., Tech. Bul. 677 (1939), pp. 82, figs. 14*).—An analysis and discussion is given of the milk and butterfat production records of the 19 foundation cows having living ♀ progeny sired by the proved sire Denton Colantha Sir Rag Apple in the Beltsville herd and the production records of the daughters. When the 32 daughters that had normal records were compared with their dams, the unweighted average production of the dams was 23 lb. of milk and 1 lb. of

butterfat more than the daughters, indicating that the sire's hereditary level of production was definitely below that of the highest-producing dams to which he was mated but above that of the lower-producing dams. The foundation cows to which this sire was mated were slightly more persistent as milk producers than his daughters. Data are also presented on the breeding records, live weights, and conformation of the dam and daughter groups.

Crossbreeding hogs for pork production, J. L. Lush, P. S. Shearer, and C. C. Culbertson (*Iowa Sta. Bul. 380 (1939), pp. 81–116, figs. 6*).—An analysis of data regarding birth weights, size of litter, mortality, gains, and feed consumption of more than 1,000 crossbred and purebred pigs involving the Poland China, Duroc-Jersey, Yorkshire, and Danish Landrace breeds showed that crossbred pigs were more vigorous from birth to weaning, averaged heavier in weight, litters were larger, and gains were more rapid with a smaller feed requirement per unit of gain than purebreds. Early comparisons were made between pigs produced in double matings. Crossbred sows were efficient pig producers when backcrossed to one of the parent breeds or when crossed with a third breed, and the pigs compared favorably with those of the first cross. Possible advantages are suggested for the use of crossbred sows because of their increased vigor, but such sows must be mated with a purebred boar if satisfactory results are to be maintained.

On the variability and inheritance of colour and pattern in the sable (Martes zibellina L.), [trans. title], A. L. Ponomarev (*Zool. Zhur. (Zool. Jour.), 17 (1938), No. 3, pp. 482–504, figs. 7; Eng. abs., pp. 503, 504*).—Study of the inheritance of color and pattern variability in sables indicated that white paws and white tip on the tail were probably due to the same recessive gene, whereas white head was determined by another recessive factor. Variations in the normal sable color from light sandy to coal black seemed due to a number of genes affecting variations in the color of the underfur tips and intensity and distribution of the long hairs. The presence of gray hairs behaved as an incomplete dominant, with age having little effect. There are two types of throat patches with several variations.

The genetics and physiology of lethal anemia in the rat, S. E. Smith and R. Bogart. (Cornell Univ.). (*Genetics, 24 (1939), No. 4, pp. 474–493, figs. 15*).—A more complete account is given of the recessive autosomal lethal anemic condition in the rat previously noted (E. S. R., 78, p. 768). Matings of heterozygotes produced 534 normal and 179 anemic progeny. The grams of hemoglobin per unit of blood, span of life, and fertility were not significantly different in homozygous and heterozygous normals. Anemics had about one-third the normal red cell count and amount of hemoglobin. However, the leucocytes were increased from 2,700 in normals to 10,000 per cubic millimeter of blood in anemics. Variations from normal were also noted in the differential white cell count, chemistry, and histology of the blood and organs. Inability of the bone marrow to assume fully its hemopoietic function at the time of birth, with some hemolysis of defectively formed red cells, seems responsible for the anemia. The condition did not respond to treatment with liver extracts, iron and copper solutions, or normal rat blood.

Linkage of pea comb and blue egg in the fowl, J. H. Bruckner and F. B. Hutt. (Cornell Univ.). (*Science, 90 (1939), No. 2326, p. 88*).—Among 35 laying daughters produced by mating an Araucana ♂ (blue egg strain) with domestic hens, 18 single-combed birds laid white eggs and 15 pea-combed progeny blue eggs. Only 2 of the daughters with pea combs laid white eggs. There was thus less than 6 percent crossing over between these genes.

Effect of testosterone on pituitary and mammary gland, R. P. Reece and J. P. Mixner. (N. J. Expt. Stas.). *(Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 1, pp. 66, 67).*—The daily administration of 200γ of testosterone propionate to spayed ♀ rats augmented the lactogen content of the pituitaries about 40 percent without changing the pituitary weight, and induced an extensive development of the lobule-alveolar system.

***Colchicine reactions in ventral prostate of castrated male rats following* androgenic treatment,** E. Z. Burkhart *(Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 1, pp. 137–139).*—Daily administration of testosterone propionate to castrated ♂ rats caused an increase in the mitotic cells in the ventral prostate from 36 to 44 hr. after injection. Colchicine injections at first arrested mitosis 6 hr. later and interfered with mitotic division thereafter.

Initiation of lactation in the albino rat with lactogen and adrenal cortical hormone, R. P. Reece. (N. J. Expt. Stas.). *(Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 1, pp. 25–27).*—By injection of suitable doses of lactogen with adrenal cortical hormone with or without glucose solution into pseudopregnant rats after ovariectomy and the removal of one mammary gland lactation was initiated. It seems that another hormone besides lactogen limits milk secretion before the effects of lactogen can be expressed.

Estrus-inhibiting effects of inanition, M. G. Mulinos, L. Pomerantz, J. Smelser, and R. Kurzrok *(Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 1, pp. 79–83).*—Starvation and injections with various chemicals and hormones causing a loss in weight resulted in the loss of recurring oestrous cycles in ♀ rats. Probably this effect was brought about through changes induced in the hypophysis.

Artificial insemination of dairy cows, H. A. Herman and A. C. Ragsdale *(Missouri Sta. Bul. 407 (1939), pp. 31, figs. 26).*—Descriptions of methods of collecting semen and its use for artificial insemination of dairy cattle are reported and illustrated. Recommendations are given for the formation of an artificial breeding association.

Artificial insemination of chickens and turkeys, W. H. Burrows and J. P. Quinn *(U. S. Dept. Agr. Cir. 525 (1939), pp. 13, figs. 8).*—A successful technic for collection of semen and artificial insemination of hens and turkeys is described and illustrated.

FIELD CROPS

[Field crops experiments, 1915–38, on Indiana Station experiment fields and farms], A. T. Wiancko et al. *(Indiana Sta. Cirs. 242 (1939), pp. 1–5, 8–19; 243, pp. 6–8; 244, pp. 5, 6–8; 245, pp. 3, 4; 246, pp. 3, 4; 247, pp. 4–7; 248, pp. 5, 6, 7, 8).*—Reports covering various periods are made again (E. S. R., 75, p. 767; 78, p. 619; 81, p. 638), including variety tests with corn (and hybrids), wheat, oats, barley, rye, alfalfa, and soybeans; crop rotations; effect of certain crops on yields of crops that follow; an experiment on the place in the rotation to apply manure; effects of methods of disposing of cornstalks on yields of corn and oats; a comparison of grain v. livestock farming; clover v. timothy for hay production; response of sweetclover to light applications of limestone drilled with the seed v. with the seed drilled on land receiving heavier amounts previously; fertilizer experiments with corn, wheat, alfalfa, and pasture; fertilizer placement for corn; cultural (including planting) tests with corn and with soybeans for hay and seed; comparison of corn and sunflowers for silage; and reinoculation of soybeans.

[Farm crops research in Mississippi] *(Miss. Farm Res. [Mississippi Sta.], 1 (1938), Nos. 1, pp. 3, 6, 8; 2, pp. 1, 2, 5, 6, 7; 3, pp. 3, 5, 6, 8; 2 (1939), Nos. 1,*

pp. 2, 3, 4, 5, 6; 2, pp. 5, 6; 3, pp. 1, 2, 4, 5, 6, 7, 8; 4, pp. 1, 2, 3, 4–6, 7, 8, figs. 4; 5, pp. 2, 4, 6, 7, 8; 6, pp. 1, 3–6, 7, figs. 2; 7, pp. 3–5, 7, figs. 3).—The progress of experiments with different field crops is reported in brief articles as follows: Vol. 1, No. 1, New Sugarcane Shows Worth With 486 Gallons Sirup per Acre by J. C. Robert; Care in Handling of Sweetpotatoes Given Added Significance, by W. S. Anderson; and Winter Legumes Add Nitrogen, Build Up Succeeding Crop Yields, by R. Coleman; No. 2, Hemp Yields High—Big Question Is Market, by H. C. McNamara; High Relative Humidity Is New Ideal in Curing, Storing Sweetpotatoes, by W. S. Anderson; Inoculation Required in Growing Legumes, by W. B. Andrews; and Out-of-State Hybrids, Native Varieties Corn Compared by 3 Stations, by C. R. Owen; No. 3, Five-Year Summary of Cotton Variety Tests Gives Food for Thought, by J. F. O'Kelly; Lespedezas Lead All Forage Crops for Hay Growth in Hill Sections, by H. W. Bennett; Interplanting Soybeans With Corn Has Mixed Effect on Yield, by R. Coleman; and Paymaster Corn Leads Holly Springs Test; Vol. 2, No. 1, Chippewa Irish Potato Leads in Delta Test, by E. A. Currey; Early to Medium Planting Dates for Corn, Mean Highest Yields; Barnyard Fertilizer Shows Worth in Test for Cotton Production, by J. C. Robert; Paymaster Corn Leads in State College Test; and Cotton Fertilizer Studies by Holly Springs Branch Station Analyzed, by E. B. Ferris; No. 2, Extra Cotton Follows Nonacid Fertilizer, by J. L. Anthony and R. Coleman; Bushel of Oats per Pound Nitrogen Applied, Delta Tests Show, by R. Kuykendall; and Excessive Cotton Land Preparation Not Justified, by T. N. Jones; No. 3, Fertilizer Placement Contributes to Crop Yield, Experiments Show, by C. Dorman; Soybeans an Important Crop for Use on the Noncotton Acres, by H. C. McNamara; Nitrogen Fertilizers Mean More Corn, by R. Coleman; Enough Nitrogen in Winter Legumes, by R. Kuykendall; Winter Legumes Best Plowed Under Prior to Maximum Growth, by I. E. Miles, T. N. Jones, and R. Kuykendall; Corn Varieties Best for State Areas, by C. R. Owen; Mamredo Selections Leading Soybeans, by J. F. O'Kelly; and Crotalaria Shows Merit in Fertilizer Tests, When Compared With Soys, by E. B. Ferris; No. 4, More, Better Grazing With Phosphates, by H. W. Bennett; Cotton Spacing—Plenty of Stalks Surest Way to Maximum Yields, by E. B. Ferris; Time to Consider Better Seed Supply, by J. F. O'Kelly; Weed Control Is Purpose of Cultivation, by T. N. Jones; Dairy Pastures at College Point Way to Successful Methods in Other Areas, by J. S. Moore; Sorghum Widely Grown Throughout Country for Forage, Ensilage, Sirup, by W. R. Perkins; Growing Sweetpotatoes, by E. A. Currey; Summer Legumes Occupy Farmers as Spring Planting Season Reaches Fullness—Fertilizer Requirements for Maximum Yields Include Phosphorus and Potash, Recommendations Made, by I. E. Miles, and Inoculation Needed for Some, Not Needed for Others, Commercial Cultures or Inoculated Soils Suitable, by W. B. Andrews and C. F. Briscoe; and Fall, Winter, and Spring Plowing Effects in Delta Seedbed Preparation; No. 5, Fertilized Cotton Benefits by Extra Supply of Nitrogen Applied as Side Dressing, by R. Cowart and W. B. Andrews; Quality Hay by Proper Methods in Curing, Handling, by T. N. Jones; Nitrogen, Chief Fertilizer Need of Corn—Side Dressing Applied Now, Good Method, by E. B. Ferris; 800 lb. 4–8–4 Fertilizer for Sugarcane, by J. C. Robert; Methods of Cotton Cultivation, by F. M. Caperton; "Buy Seed Oat After Field Inspection" Recommendation of Delta Branch Station, by H. C. McNamara; When Cotton Follows Legume Crop in Delta Legumes Supply Enough Nitrogen, by R. Kuykendall; and Supplement Pastures for Long Grazing, by J. S. Moore; No. 6, Still Time to Plant Feed Crops; Growing Soybeans in the Yazoo-Mississippi Delta, by H. A. York; Soybean Varieties, by J. F. O'Kelly; and Fertilizer for Sorghum About as for Cotton, by W. B. Andrews and R. Cowart; No. 7,

Growing Soybeans, Part 2, Utilization, Breeding, Varieties, by H. A. York; and For Best Yields of Cowpea Hay Cut Full Bloom Stage, by H. W. Bennett.

[Field crops investigations in New Mexico]. (Partly coop. U. S. D. A.). (*New Mexico Sta. Rpt. 1938, pp. 16–20, 21–26, 28, 29, 33–35, 43–45, 68, 69, 71, 73, 74, 76–78, 79–81, figs. 2*).—Reports of progress are made from research with field crops (E. S. R., 79, p. 41) at the station and on outlying fields, including variety tests with winter- and spring-sown wheat and barley, corn, oats, grain sorghum, sorgo, millet, cotton, potatoes, sugar beets, alfalfa, soybeans, cowpeas, beans, and miscellaneous forage crops; trials of barley and winter legumes for green manure and of flax and rice; breeding work with barley, cotton, and pinto beans; cultural tests with potatoes; fertilizer experiments with barley, sugar beets, cotton, alfalfa, and potatoes; date of planting and plant bed experiments with sweetpotatoes; tests of different forms of sulfur for control of psyllid yellows and comparisons of mineral elements used as supplements with a standard (NPK) fertilizer for stimulation of plant vigor to resist this disease; seed treatments with wheat, barley, cotton, and corn; irrigation tests with Acala cotton; studies of the annual production of sugar beet seed, concerned with effects of preceding crops and green manures, and application of various fertilizers and manure; crop rotations; studies of the restoration of ranges by artificial revegetation; control of Johnson grass by chlorates and burning; and control of soil blowing by cultural practices and sorghum varieties.

[Field crops research in Rhode Island] (*Rhode Island Sta. Rpt. [1938], pp. 11–17, 21–23, 24, 37–39, 43*).—Progress results are reported from variety tests with corn, potatoes, and lawn and turf grasses; fertilizer experiments with potatoes, mixed hay, and lawn and turf grasses, particularly varieties and strains of bents; planting and source of magnesium tests with potatoes; production tests with Ladino clover; residual effects from different levels of fertilizer for truck crops, as shown by yields of mixed hay and potatoes; effects of crops on succeeding crops; crop rotations; response of pasture grasses to different lengths of day and levels of soil moisture; breeding work and inheritance studies with alfalfa; control of lawn weeds; chloropicrin treatments on compost and seedbed soil for weed seed control; seed production of bentgrass varieties and strains; and comparison of Sudan grass, millet, oats, and winter rye for supplementary pasture.

The number of replicated small plat tests required in regional variety trials, J. B. HARRINGTON (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 287–299*).—During 1935–37, 1,010 tests each comprising between 18 and 25 4-row plats of wheat or barley varieties replicated from 3 to 5 times were distributed on farms over an area of 100,000 sq. miles in Saskatchewan. Variance analyses on grain yield showed that this large number of tests was needed to reveal the comparative behavior of the varieties under the particular conditions existing in many different localities. Marked reduction in number of tests would probably have obscured some differences and made much of the information from the remaining tests of doubtful significance.

Formulas for finding estimates for two and three missing plots in randomized block layouts, W. D. BATEN (*Michigan Sta. Tech. Bul. 165 (1939), pp. 16*).—The method given by Yates (E. S. R., 70, p. 36) is used to find explicit formulas for estimating two and three missing plats in randomized block layouts, and examples showing how to use these formulas are given. Part 1 on two missing values considers two missing plats in the same treatment, missing plats in the same block, and missing values in different treatments and blocks. Part 2 on three missing values deals with missing plats in the same treatment, missing values in the same block, two missing values in the same treatment

and two in the same block, two missing values in the same treatment—each in different blocks, two in same block—each in different treatment, missing values in different treatments and different blocks, and one missing value.

A modern statistical analysis for field experiments: The analysis of variance for simple factorial experiments, R. J. BORDEN (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *43* (*1939*), *No. 2, pp. 73–114*).—The non technical discussion of the application of the analysis of variance presented shows by actual example how results from field experiments can be set up and examined for evidence that measured yield differences between treatments are really an effect of the treatments and not more likely due to chance. Plans and analyses for the simpler forms of factorial experiments are offered as a suggested improvement in experimental technic.

Major changes in grassland as a result of continued drought, J. E. WEAVER and F. W. ALBERTSON. (Univ. Nebr.). (*Bot. Gaz.*, *100* (*1939*), *No. 3, pp. 576–591, figs. 9*).—Many perennial grasses decreased markedly in abundance as a result of the great drought of 1934–37. Little bluestem (*Andropogon scoparius*), once a most important dominant, suffered great depletion and disappeared from some prairies. Bluegrass (*Poa pratensis*), big bluestem (*A. furcatus*), and Indian grass (*Sorghastrum nutans*) all became much less abundant on uplands. Most species of forbs, including those very deeply rooted, gradually succumbed to the continued drought until they were only from one-half to one-third of their former abundance. *Festuca octoflora*, *Bromus secalinus*, and other annual grasses which became very abundant after 1934 greatly decreased in quantity later, filling smaller interspaces rather than occupying large areas. Wild peppergrass (*Lepidium virginicum*), so serious in 1936–37, had distinctly disappeared. Other annual weeds were extremely abundant only during one or two seasons. The perennial *Aster multiflorus*, with rhizomes, spread so widely into drought-bared areas as to ruin many prairies for production of hay. *Erigeron ramosus* was almost equally widespread. Many forbs with fleshy storage organs, as *Oxalis violacea*, *Allium mutabile*, and *Tradescantia bracteata*, increased remarkably in abundance. Western wheatgrass (*Agropyron smithii*) occurred sparingly at the beginning of the drought but spread so widely as to occupy from one-half to three-fourths of many former bluestem prairies. Numerous native grasses and especially *Stipa spartea*, *Sporobolus heterolepis*, and *Bouteloua curtipendula* became far more abundant and important. The short grasses (*B. gracilis* and *Buchloe dactyloides*) greatly increased. Drought reduced the basal cover in true prairie from 50 to 66 percent. The lower layer of grasses and forbs was almost destroyed, and grassland types were much modified.

The nitrogen content of grasses as influenced by kind, frequency of application, and amount of nitrogenous fertilizer, R. I. MUNSELL and B. A. BROWN. ([Conn.] Storrs Expt. Sta.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 5, pp. 388–398, figs. 4*).—Effects of eight different nitrogen sources and frequencies and rates of application of Cal-Nitro on the nitrogen content of Kentucky bluegrass and Rhode Island bentgrass were studied for 1936 and 1937 as part of a broad pasture project (E. S. R., 75, p. 618). Only ammonium carbonate applied to pure stands of these grasses failed to result in significant increases in total nitrogen over untreated plats. The other nitrogen carriers did not differ much among themselves in this respect. Marked increases in total nitrogen in both grasses occurred only in the first cutting after Cal-Nitro was applied, and its influence was not evident after about a month. A single application in April produced its greatest effect in May, and then the nitrogen content fell rapidly and remained low for the rest of the season. When the

fertilizer was withheld until June or August, the highest point in total nitrogen for the season was reached in the succeeding cutting. Fourteen lb. of nitrogen applied six times during the season produced about the same increase with less fluctuation in average nitrogen content over no treatment as three applications of 28 lb. When 56 lb. of nitrogen were applied three times, the further increases obtained in average nitrogen contents were 0.39 percent in Kentucky bluegrass and 0.32 percent in Rhode Island bent. Percentage recoveries of nitrogen indicated that Cal-Nitro, calcium nitrate, ammonium sulfate, and sodium nitrate were the more efficient carriers. When Cal-Nitro was applied at different times the greatest nitrogen recovery was obtained from plats treated only in April and the least from plats treated in August.

Response of certain perennial grasses to cutting treatments, C. M. Harrison and C. W. Hodgson. (Mich. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 5, pp. 418–430, fig. 1*).—When five grasses and a mixture of smooth bromegrass and alfalfa grown in 10-in. clay pots were cut weekly at 1-, 3-, and 6-in. heights, the species differed in amount of injury incurred by continuous close clipping and rated, beginning with the least injured, in the order Kentucky bluegrass, quackgrass, smooth bromegrass, with timothy and orchard grass about equal. The greatest total yields of top growth and of underground parts (roots and rhizomes) were usually obtained from plants allowed to go unclipped. Yields decreased with increase in severity of cutting. Smooth bromegrass did better in mixture with alfalfa than when grown alone.

Vegetational changes as a result of furrowing on pasture and range lands, C. J. Whitfield and C. L. Fly. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 5, pp. 413–417, figs. 4*).—Striking increases in yield of air-dry forage and quality of pasture vegetation as to desirable species followed pasture furrowing and contour listing on several projects in Texas.

Pasture yields and consumption under grazing conditions, R. F. Fuelleman and W. L. Burlison. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 5, pp. 399–412, figs. 7*).—Calculated yields and consumption of pasturage at Urbana, Ill., 1935–37, showed that yield curves of pasture grasses parallel rather closely precipitation curves but are the reverse of temperature curves. When temperature rises grass yields tend to decrease. Alfalfa is rather uniformly productive throughout the grazing season. Kentucky bluegrass may have some serious defects, but excels in general adaptation, utility, and persistence. Bromegrass persistently outyielded other grasses studied and apparently is high in palatability, as indicated by curves of consumption and production, and has persisted remarkably well. If growth and consumption are a criterion of palatability, orchard grass seemed to rank almost equally with Kentucky bluegrass. Reed canary grass not relished by cattle, particularly when stemmy, may have a limited use for pasturage, particularly on land adapted to other pasture crops, although it may provide both hay and pasture on land subjected to periodic inundation.

Greenhouse studies of the effect of clipping the tops of alfalfa at various heights on the production of roots, reserve carbohydrates, and top growth, C. M. Harrison. (Mich. Expt. Sta.). (*Plant Physiol., 14 (1939), No. 3, pp. 505–516, figs. 4*).—When top growth of alfalfa plants was removed weekly at specified levels for 8 successive weeks, as compared with responses of uncut cultures, marked reductions were found in production of new top and root growth and root (starch) storage in cultures cut at 1 in. and somewhat lesser reductions in cultures cut at 2 in., whereas cutting at 6 in. interfered only slightly in these respects. The significance of these observations in management of alfalfa pastures (E. S. R., 81, p. 505) is pointed out.

Differential survival of alfalfa strains under an ice sheet, R. A. Brink, W. Keller, and C. Eisenhart. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 1, pp. 59–71, figs. 4*).—Ice sheets which form on the land when rain falls at freezing temperatures often damage alfalfa greatly in Wisconsin and adjacent States. An ice sheet (intermediate in severity) during January and February of 1937 provided an opportunity to study the reaction of alfalfa to such injury in a plat at Madison, Wis., containing 42 strains, many of which were self-fertilized selections from Grimm or their hybrids. The parental lines had been selected on the basis of cold resistance as measured by artificial freezing. Both Grimm and Hardigan alfalfa served as checks. The mortality on the plat averaged 42 percent, with values for individual strains ranging from 12 to 96 percent. Significant differences in survival between strains occurred and, furthermore, several strains were more resistant than either Grimm or Hardigan. Strains of hybrid origin were more resistant than their inbred parents. Since the reaction of alfalfa strains to an ice sheet depends upon the severity of the ice sheet complex, the authors feel that under more severe conditions significant differences established in the present study would doubtless be obliterated.

Effect of artificial drying upon the germination of seed corn, T. A. Kiesselbach. (Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 6, pp. 489–496*).—Drying experiments with seed corn, 1937 and 1938, involving procedure similar to that of Harrison and Wright (E. S. R., 62, p. 629) showed an apparent inverse relation between drying temperature and minimum moisture content attained by the dried seed. After 5 days of drying at 112° F. the moisture approximated 5 percent, while at 107° it was about 6.5 percent. It seemed that little further desiccation would occur from prolonged exposure at these temperatures. Seed with initial moisture content up to 30 percent and reduced to as low as 5 percent by drying for 5 days at 112° showed no unfavorable effects on field stand or seedling growth. When dried at 112° no significant differential injury appeared among 26 representative hybrids ranging from 16 to 38 percent in moisture content.

Timely and suitable drying of seed corn with heated air under forced draft may remove the freezing injury hazard, facilitate early harvest, storage, and processing, and avoid injury to seed viability or field performance. With such artificial drying, reduction in moisture content to from 12 to 13 percent at a range of from 105° to 110° is recommended except that temperature be held as low as 105° when the initial moisture content approaches 50 percent. Prolonged drying at safe temperatures to as low as 5 percent moisture is not harmful, although not practical. Insufficient drying subjects the seed to later loss of weight and possible deterioration in storage. The moisture content permissible for safe processing and storage ranges from 5 to 14 percent. The drying period needed to reduce ear corn to a safe moisture content varies with the initial moisture content of grain and drying temperature, approximately 1, 2, or 3 days for corn containing 20, 30, and 50 percent moisture, respectively, provided the air is changed enough.

Composition of bark and inner part of roots of the cotton plant, L. E. Hessler, D. R. Ergle, N. E. Rigler, and J. E. Adams. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, *31* (*1939*), *No. 6, pp. 528–540, figs. 2*).—In continued studies (E. S. R., 80, p. 762), the bark was separated from the stele of roots of cotton plants grown on Wilson clay loam soil under various fertilizer treatments. Under experimental conditions covering the period from early square formation to early opening of bolls, the bark was found to be particularly rich in the labile carbohydrate and dialyzable nitrogenous constituents. The inner por-

tion of the root contained more polysaccharides and dialyzable and nondialyzable phosphates. The latter constituents increased when phosphates were added to the soil. All nitrogen fractions in the root parts, especially the cathode-nitrogen constituents in the bark, were influenced by the composition of the fertilizer used. The ketose sugars appeared to be important in the physiology of the cotton plant.

The response of lespedeza to lime and fertilizer, R. E. STITT. (U. S. D. A. and N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 6, pp. 520-527, figs. 2*).—Korean lespedeza did not respond significantly to lime and fertilizer and Kobe lespedeza responded only slightly to lime when grown on Cecil loam receiving complete fertilizer in the previous season. These varieties and common lespedeza and *L. sericea* responded to phosphate and lime on unfertile Cecil gravelly loam. The calcium and crude protein contents of Kobe and Korean plants growing on this soil were increased by addition of both lime and superphosphate, and their phosphorus contents rose in response to superphosphate. Under conditions of low phosphate availability, Kobe and Korean endured drought better than common lespedeza, which seemed unable to survive with the fertility level provided. *L. sericea* with its perennial root was not affected by drought.

[Potato research in Ohio] (*Ohio Veg. and Potato Growers Assoc. Proc., 24 (1939), pp. 5-18, 30-46*).—These papers include Potato Demonstration Results in 1938, by E. B. Tussing (pp. 5-9) (Ohio State Univ.); Fertilizers for Early Potatoes, by J. Bushnell (pp. 9-14), and Factors Affecting Marketability of Ohio Potatoes, by C. W. Hauck (pp. 30-34) (both Ohio Expt. Sta.); Potato Varieties Better Suited to a Specific Set of Growing Conditions (pp. 14-18) and Variability in Cooking Quality in Potatoes (pp. 42-46), both by F. J. Stevenson (both U. S. D. A.); and Damage to Ohio Potatoes by Digging Machinery, by E. B. Tussing, E. A. Silver, and C. W. Hauck (pp. 34-42) (Ohio State Univ. and Ohio Sta.).

Soil management for potatoes, G. M. GRANTHAM, C. E. MILLAR, and A. H. MICK. (Partly coop. U. S. D. A.). (*Michigan Sta. Spec. Bul. 299 (1939), pp. 31, figs. 2*).—Information is given on the soil type and plant food needs and the status of the potato crop in Michigan, together with a report on fertilizer experiments conducted 1923-38 on 70 farms. In general, potatoes are grown on sandy loam and loam soils less fertile than the better soils.

Manure supplemented with complete commercial fertilizer, as 4-16-8, is deemed excellent for potatoes. Large increases in yields resulted in Montcalm County in 1928 wherever manure or commercial fertilizer was applied, but highest increases were obtained where both were used.

Fertilizer of 4-16-8 or similar formulas gave yield increases consistently among the highest produced on different soil types and under the varied weather conditions encountered. Fertilizer containing more potassium in relation to phosphorus, as in a 3-12-12 mixture, often gave as good or better yields than the 4-16-8, especially on the sandier soils. Fertilizer with as much or more potassium than phosphorus tended to delay maturity and often resulted in immature tubers at digging time. Applications of about from 500 to 600 lb. per acre were found most advisable, although larger yield increases were often obtained with heavier rates.

When placed in bands on both sides, on the level or a little deeper than, and about 2 in. from the seed, fertilizer resulted in slightly better average yields than the same quantity applied in other locations. Fertilizer mixed in the soil around the seed delayed sprout emergence, which, however, was often hastened by fertilizer applied in bands 2 in. to the sides of the seed. Under irrigation at Lake City, heavier amounts of fertilizer were used efficiently, and

applications could be made closer to the seed piece without resultant injury. When fertilizer was not applied near the seed at planting, application with an attachment to the cultivator at first cultivation proved advisable.

Tillering ability of sorghum varieties, J. B. Sieglinger and J. H. Martin. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 6, pp. 475-488, figs. 2*).—Number of stalks per plant was determined in 105 varieties of sorghum grown at Woodward, Okla., 1930-37, in rows in which plants were spaced at about 7 and 36 in. apart. Stalks produced per plant in the 36-in. spacing by the various sorghum groups averaged for hegari 4.23, feterita, 4.03, sorgo 3.20, milo 2.97, kaoliang 2.10, kafir 1.74, and durra 1.47. The 6-yr. average number of stalks per plant in 79 varieties was 1.28 in the 7-in. and 2.39 in the 36-in. spacing. Some varieties produced no tillers in certain seasons, while one variety averaged 6.8 stalks per plant in the 36-in. spacing in 1936. Varietal rank in number of stalks per plant was very similar in the two spacings, except when spacing was not uniform, although varietal differences were smaller in the 7-in. spacing. Small variations from average spacing had little effect on number of stalks per plant in kafirs and other varieties producing few tillers but were important in many varieties that tiller freely. Hegari produced a considerable number of tillers in all seasons and in both spacings. Dwarf Yellow and certain other milos usually tillered freely, but tillering fluctuated more with environment than in hegari. The proper plant spacing for a variety evidently depends largely upon its tillering ability. Varieties that tiller poorly should be planted relatively thick.

A study of sorghum with reference to the content of HCN, C. J. Franzke, L. F. Puhr, and A. N. Hume (*South Dakota Sta. Tech. Bul. 1 (1939), pp. 51, figs. 6*).—The influence of heritable, environmental, and cultural factors on the hydrocyanic acid content of sorghum was studied 1933-38. HCN was recovered from sorghum plants by precipitation with silver nitrate. The aspiration method invariably recovered lower amounts and recovered no HCN from silage.

Varieties and strains of sorghum were found to vary in contents of HCN. The low-HCN strains were consistently lower in HCN content throughout the growth period than were the high-HCN strains. Genetic studies indicated that HCN content in sorghums is controlled by heritable factors, and that low HCN seems to be partly dominant over high HCN. Apparently, only one or two main factors and possibly several minor modifying factors are involved.

The relative amount of HCN in leaves and stems is not constant. The average HCN content in stems analyzed was only 12.37 percent of that in the leaves. Contents of HCN occurring in sorghums differed slightly at two different periods in the day; varied to some degree at the same stage in a selfed strain as between four locations; were higher at the shooting stage in slow-growing plants of both low HCN and high HCN strains on Orman clay than in faster growing plants on Barnes loam; were lower when phosphate, potassium, and stall manure were applied (except when with lime); and rose with the regular use of nitrogen. Increases apparent after green manure were probably because growth of green manure may have reduced available soil moisture, which might inhibit the rapid growth of sorghum. The HCN content from irrigated sorghum appeared to be decidedly lower than in that from dry land. HCN content dropped with increased soil moisture, and also appeared to be affected by atmospheric conditions.

Maximum HCN content evidently occurs early, at the eight-leaf stage, diminishes slowly until the blooming stage, and then more rapidly to a minimum at maturity. Apparently a gradual loss of HCN occurred in the sorghums during the drying process. The average HCN in 12 strains dried in shade diminished

generally from the earliest growth stage to complete maturity similar to green forage. HCN content in the sun-cured portions was invariably lower than that of comparable uncured and shade-cured samples. Strain differences were observed in losses of HCN in drying or curing.

The average percentage loss of HCN for all strains in 1934 and 1936 over 6 weeks of shock curing was 79.5. The HCN in sheaves from the outside tier of a shock put up just after harvest was lower after 6 weeks' curing than in either inside tier. Permitting sheaves to lie on the ground 3 days before shocking apparently reduced their content of HCN appreciably.

Freezing, though not a direct cause of increase in HCN content of sorghum, evidently results in a more rapid and complete liberation of HCN than is normally found in sorghum plants. This might explain certain cases of sorghum poisoning after heavy frosts, especially if animals have access to sorghum after freezing. Sorghum stored as silage lost part of its original content of HCN, although the losses varied widely. No correlation was seen between amounts of HCN and percentage of total sugar in the strains studied.

Whatever conditions of environment may promote normal and regular growth in sorghum plants evidently lead to minimum HCN content therein. Conditions which retard such normal development of sorghum plants, in greater or less degree, bring about corresponding increase in amounts of HCN in subsequent growth.

The soybean and soy industries, A. MATAGRIN (*Le Soja et les industries du soja. Paris: Gauthier-Villars, 1939, pp. X+390, figs. 46*).—This book considers in successive chapters (each with bibliography) the history and status of the soybean industry and its world commercial importance, botanical characteristics and cultural requirements, chemistry of the soybean, soybeans in food products, soybean oil and byproducts, vegetable lecithin, and vegetable casein and plastics from soybean meal.

The influence of space and arrangement on the production of soybean plants, R. G. WIGGANS. (Cornell Univ.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 4, pp. 314–321, figs. 2*).—The advantage of the solid drill (8 in.) method over rows wider apart (28 in.) when early maturing soybean varieties are used for the purpose of grain production was illustrated in tests with three soybean varieties, 1931–37. When Cayuga soybeans (E. S. R., 72, p. 42) were planted, 1934–37, about ½, 1, 1½, 2, 3, 4, and 6 in. apart in 8-, 12-, 16-, 24-, and 32-in. rows, gross yields showed that yield decreases with any and all increases in distance between rows; that a wide range in distance between plants in the row has little effect on production, although yield tends to be greatest with the thickest planting, and with a gradual falling off as spacing increases; that spacings greater than 3 in. within the row show significantly smaller yields than thicker rates; and that an acre yield of 40 bu. approaches the "ceiling" for this variety under central New York conditions. The net yields indicated that the thickest plantings within the rows do not give the greatest returns, and that the spacing within the rows giving the maximum yield varies from 3 in. apart in 8-in. rows to 1 in. apart in 32-in. rows. Optimum rates and spacings should be determined for both the different producing areas and for the soybean varieties to be grown. A variety has an optimum number of plants per unit area for maximum net increase, this being six plants per square foot for Cayuga.

International Society of Sugar Cane Technologists: Proceedings of the Sixth Congress (*Baton Rouge, La.: Internatl. Soc. Sugar Cane Technol., 1939, pp. XXIII+1129, [pl. 1], figs. [322]*).—The session of this Congress, held October 24 to November 5, 1938, at Louisiana State University, included general and

sectional meetings concerned with cultural and field practices, soils, diseases and insect pests, experimental technic, factory operation, and chemical control. Discussions followed most of the papers.

Papers of agronomic interest included The Development of the Sugarcane Industry in Louisiana and the Southern United States, by C. A. Browne (pp. 46–69) (U. S. D. A.); Sugarcane Improvement Work in New South Wales, by D. S. North (pp. 79–87); Report of the Special Standing Committee on Description and Identification of the Original Cane Varieties, by W. W. G. Moir (pp. 113–115); Relative Usefulness and Variability of Vegetative Characters in Sugarcane Taxonomy (p. 115) and Illustrated Outline for Use in Taxonomic Description of Sugarcane Varieties (pp. 116–127), both by E. Artschwager, and Assembling and Evaluating Wild Forms of Sugarcane and Closely Related Plants, by E. W. Brandes, G. B. Sartoris, and C. O. Grassl (pp. 128–153) (all U. S. D. A.); On Certain Floral Characters in Sugarcane, I, by N. L. Dutt, M. K. Krishnaswami, and K. S. Subba Rao (pp. 154–170); Brief Description of a Crossing-Lantern Used by the Sugarcane Research Station, Mauritius, by A. de Sornay (pp. 170, 171); Sugarcane Collection in New Guinea During 1937, by C. G. Lennox (pp. 171–182) (Hawaii. Sugar Planters' Expt. Sta.); Double Versus Single Planting, by C. H. B. Williams and L. A. Forte (pp. 266–271); Caneland Cultivation in Mauritius, by A. N. Coombes (pp. 271–275); Interplanting on Sugarcanes to Paddy Rice, by T. Fukuchi (p. 275–277); Recent Soil Studies in Mauritius, by P. Halais (pp. 278–284); The More Important Soils of the Sugarcane District of Louisiana and Their Physical Characteristics, by A. M. O'Neal and L. A. Hurst (pp. 284–295), Preliminary Chemical Studies of Four Soil Types in the Louisiana Sugarcane District, by N. McKaig, Jr., and L. A. Hurst (pp. 296–302), Soil Fertility and Fertilizer Studies With Sugarcane in Louisiana, by L. A. Hurst and R. L. Holmes (pp. 304–313), Preliminary Studies on the Correlation of Cane Juice Analyses With Soil Analyses, by R. L. Holmes (pp. 314–319), and The Influence of the Soil on the Chemical Composition of Louisiana Sugarcane Juices, by N. McKaig, Jr., and C. A. Fort (pp. 319–325) (all U. S. D. A.); A Note on the Sugarcane Soils of British Guiana, by R. R. Follett-Smith (pp. 326–333); Stubble Deterioration, by C. W. Edgerton (pp. 334–341) (La. State Univ.); On the Influence of the Phosphorus Deficiency Upon the Vegetative Growth, Accumulation of Sugars, Nitrogen Content, and the Ash Constituents in the Sugarcane Plant, by T. Saito and M. Kenjo (pp. 347–357); Report of the Committee on Technique of Field Experiments, by G. Arceneaux (pp. 387–390), Portable Apparatus Used for Weighing Sugarcane in Agronomic Experiments in Louisiana, by I. E. Stokes and R. T. Gibbens, Jr. (pp. 391–395), and Improvements in the Methods and Equipment for Weighing Cane From Experimental Plots Used by the Soil Fertility Division of the U. S. Bureau of Plant Industry, by R. L. Holmes and A. M. O'Neal (pp. 396–399) (all U. S. D. A.); Cane Sampling Methods With Field Experiments, by H. W. Kerr (pp. 399–403); Border Competition in Sugarcane Variety Tests Under Louisiana and Georgia Conditions, by G. Arceneaux, I. E. Stokes, B. A. Belcher, and R. T. Gibbens, Jr. (pp. 403–419) (U. S. D. A.); An Outline of Recent Sugar Control Programs and Their Effect on the Louisiana Sugar Industry, by M. Voorhies and W. M. Grayson (pp. 514–523) (La. State Univ.); Mechanical Harvesting of Sugarcane in Hawaii, by W. J. Maze (pp. 524–529) (Hawaii. Sugar Planters' Sta.); Windrowing Cane for the Mill, by C. L. Denley (pp. 532–534); Land Preparation for Sugarcane, by J. A. Gibb (pp. 536–543); Notes on Labor-Saving Devices, by H. T. Barr (pp. 544–548) (La. State Univ.); Hawaiian Rapid Chemical Methods at Natal Estates, Limited, Mount Edge-

combe, by B. Campbell (pp. 617–629); The Laboratory Determination of Soil Fertility, by H. W. Kerr and C. R. von Stieglitz (pp. 629–639); Comparison of Soil Analyses With the Response of Sugarcane to Fertilization, by R. L. Holmes and L. A. Hurst (pp. 640–649), and Laboratory and Field Methods for Determining Fertilizer Requirements of Soils, by O. Schreiner and M. S. Anderson (pp. 650–663) (both U. S. D. A.); Some Studies in Soil Sampling Technique, by H. W. Kerr and C. R. von Stieglitz (pp. 664–672); A Preliminary Note on the Field Experimentation of the Cane Sugar Section, by J. M. Aguirre, Jr., H. C. Arruda, and A. J. Rodriguez (pp. 672–679); The Selection of Second Year Seedlings, by A. F. Bell (pp. 710–713); Yield Trends in Louisiana as Affected by Varieties, by C. L. Denley (pp. 714–717); Seedling Selection in Mauritius, by A. de Sornay (pp. 718–726); Sugarcane Varieties in Hawaii, by A. J. Mangelsdorf (pp. 726–731) (Hawaii. Sugar Planters' Sta.); Cane Hybridization Work in Coimbatore, by T. S. Venkatraman (pp. 731, 732); Studies in Experimental Technique: Plot Arrangement, by R. J. Borden (pp. 733–744) (Hawaii. Sugar Planters' Sta.); A Study of the Relation Between Size of Field Sample and Experimental Errors of Juice Analysis and Sugar-Yield Determinations in Connection With Sugarcane Variety Tests, by G. Arceneaux, I. E. Stokes, B. A. Belcher, and R. T. Gibbens, Jr. (pp. 744–758), and A Study of the Number of Stalks of Cane Required for Accuracy in Sampling Experimental Plots, by R. L. Holmes and A. M. O'Neal (pp. 760–764) (both U. S. D. A.); Notes on Plot Technique, by H. W. Kerr (pp. 764–778); An Efficient and Compact Layout for Sugarcane Fertilizer Tests, by C. H. B. Williams and R. R. Follett-Smith (pp. 778–784); On the Arrowing Tendency of Sugarcanes Along the Edges of the Fields, by M. Yamasaki and H. Oda (pp. 793–795); The Behavior of Sugarcane in Relation to Length of Day, by G. B. Sartoris (pp. 796–801) (U. S. D. A.); Some Aspects of the Problem of Drought Resistance in Sugarcane, by H. Evans (pp. 802–807); Resistance to Inversion of Sucrose in Harvested Sugarcane in Louisiana, by J. I. Lauritzen, R. T. Balch, and C. A. Fort (pp. 809–818) (U. S. D. A.); The Composition of the Crude Chlorophyll of Cane Leaves and Its Relationship With Cane Growth, by C. E. Beauchamp and F. Lazo (p. 819–832); Suggested Ways and Means of Meeting New Economic Problems in the South African Sugar Industry, by P. Fowlie (pp. 833–839); Flood-Fallowing of Sugarcane Soils, by R. R. Follett-Smith (pp. 840–843); Deep Tillage Work in Louisiana Using the Gyrolette, by C. L. Denley (pp. 843–845); and Drainage of Peat Soils in the Florida Everglades, by B. S. Clayton (pp. 846–851) (Fla. Sta. coop. U. S. D. A.).

Interests of factory technologists and chemists were considered in papers noted on page 758, and those of economic zoology and entomology on page 812.

Timothy culture, M. W. EVANS, F. A. WELTON, and R. M. SALTER. (Coop. U. S. D. A.). (*Ohio Sta. Bul. 603 (1939), pp. [1]+54, figs. 6*).—Planting, fertilizer, and cutting experiments with timothy were made during different periods at North Ridgeville and also at Wooster, Ohio.

In seeding tests comprising rates from 1.25 to 20 lb. per acre, results indicated that 3 or 4 lb. may be a satisfactory rate with winter grain in the fall. Spring-sown with oats as a companion crop, timothy made slightly larger yields from 10 lb. than from 5 or 20 lb. of seed. In a number of tests somewhat higher hay yields containing a higher proportion of clover were obtained from spring than from fall sowings, both at a 10-lb. rate and in mixture with spring-sown red clover, but these yields usually were less than from 2.5 or 5 lb. fall sown or from split seedings (2.5 lb. in fall, 7.5 lb. in spring). Effects of different seeding rates upon the meadow diminished with age, and rate of seeding

and protein content of the hay were not related consistently. Sown alone, medium red clover outyielded timothy, but the yield of neither separately equaled that of the two combined.

At Wooster neither superphosphate alone or in mixture with potassium increased yields, but sodium nitrate with these materials increased acre yields of hay and protein. At North Ridgeville superphosphate alone and with potassium increased hay yields, chiefly through larger growth of volunteer clover. Hay on unfertilized plats averaged (5 yr.) 6.04 percent protein, and from 300- to 1,600-lb. applications of sodium nitrate increased the content from 0.53 to 2.55 percent, but no increase came from smaller rates. The second cutting averaged 7 percent as large as the first in yield, and its protein content averaged 9.96 percent on unfertilized land and exceeded 11 percent on heavily fertilized plats. Second crops were obtained only in 1931 and 1932 and both were rather light.

When sodium nitrate, 200 lb. per acre, was applied about October 1 and about every 2 weeks from March 15 to June 15, on the average the maximum came from April 15 treatment. October applications were nearly as effective as those from March 15 to May 1. Highest recovery of added nitrogen and highest protein yield were obtained from plats fertilized May 15. A second application of 200 lb. before harvesting increased the hay yield 375 lb., protein 0.74 percent, and protein yield 51 lb. Among nine nitrogen carriers compared, organic forms were somewhat less effective than the inorganics, which did not differ much in effects upon hay.

When timothy was cut for 5 yr. at six growth stages, the highest hay yield on unfertilized plats was obtained when the earliest heads were turning straw color, the highest protein percentage 8.6 at beginning of heading, and the highest acre yields of protein from fully headed to early bloom. Similar results were obtained on fertilized plats. For highest quantity and quality of hay combined, timothy evidently should be cut in early bloom.

Summer applications of sodium nitrate made before harvest increased hay yields and also percentages and yields of protein more in the plats cut early than in those cut late. Summer applications after cutting produced similar increases the next year in the yields of hay and protein but not in protein percentages.

When commercial grades were assigned to timothy cut at different growth stages, the earlier cuttings only graded Number 1 Extra Green, and the use of nitrogen slightly reduced the grade. Yields on uniform cuttings after the stage of cutting tests were ended showed that early cutting affected adversely the permanence of the meadow.

The haplocorms or bulbs continued to develop until about plant maturity, after which they began to decrease in weight simultaneously with appearance of new shoots.

Recommendations are made on production of timothy seed.

Some aspects of the physiology and nutrition of tobacco, W. W. Garner (U. S. D. A. and N. C. and Md. Expt. Stas.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 5, pp. 459–471, figs. 4*).—The necessity for developing a physiological approach to the tobacco fertilizer problem, particularly on light sandy and sandy loam soils, was demonstrated in tests with potash salts at Oxford, N. C., which resulted in the discovery (E. S. R., 48, p. 454) of magnesium deficiency in these soils, accompanied by characteristic deficiency symptoms in the crop. Chemical analysis of these soils and of tobacco they produced, supplemented by field tests, indicated that they may be as deficient in calcium, magnesium, and sulfur as in nitrogen, phosphorus, and potassium. In specific cases soil deficiency in all six elements was demonstrated by marked depression in yield, occurrence

of distinctive deficiency symptoms in the crop, and abnormally low content in the crop of the particular element withheld from the fertilizer. These soils are regarded simply as rather impure sand culture media, and it is not considered logical to apply to these soils carriers containing two or more essential elements, without compensating treatment, and attempt to evaluate results obtained with plants in terms of only one constituent element. With soils properly selected with respect to these criteria of mineral deficiency and with precaution of varying the supply of only a single essential element, excellent data were obtained on absorption by the plant in relation to increased supply of this element. By utilizing this plan of conducting "field sand cultures," consistent and significant results have been obtained in extensive physiological studies of effect of the nitrogen supply on growth and development phenomena, metabolism, and other internal relations, and on the chemical and physical properties of the cured tobacco leaf.

Drying and curing of bright leaf tobacco by means of conditioned air, A. H. Cooper, C. D. Delamar, and H. B. Smith (*Va. Polytech. Inst. Bul., 32 (1939), No. 6, pp. 28, figs. 8*).—In the experimental application of air conditioning to the curing and drying of tobacco, drying rate curves for each period of the curing process were obtained over a wide range of constant conditions of temperature, humidity, and air velocity. Correlation of the curing curves indicated narrow limits of conditions for satisfactory curing and critical points beyond which poor quality of tobacco results. "From the results obtained, air conditioning improves the process by (1) reducing the time approximately by one-half, doubling the capacity of the barn; (2) production of uniform quality tobacco, completely eliminating loss from improper curing; and (3) considerable reduction in labor and fuel requirements." Another suggested advantage is reduction of fire hazard.

Effect of mutilation of wheat seeds on growth and productivity, W. J. Sando. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 6, pp. 558–565, figs. 2*).—"When wheat is threshed, some of the grains are usually broken. This damage in very dry wheat frequently exceeds 2 percent and may amount to more than 10 percent. The value for seeding purposes of the germ end of broken grains is of interest to the farmer."

Planted in rows in the field at Arlington, Va., 1933–35, whole kernels of Dawson and Nittany winter wheats were superior to half and one-third (germ-end sections) kernels in germination and in subsequent plant survival and number of culms (with one exception), total weight, and grain yield per plant. Half kernels likewise were usually superior to one-third kernels. Half kernels with the cut ends capped with paraffin were superior to unparaffined half kernels except in seed germination and in percentage of seeds producing mature plants. In general, greenhouse experiments with Baart spring wheat confirmed the results from the field plantings of winter wheat.

Further studies upon the relative macaroni-making quality of a number of durum wheat varieties, D. S. Binnington and W. F. Geddes (*Cereal Chem., 16 (1939), No. 3, pp. 384–392*).—In an extension of earlier studies (E. S. R., 78, p. 480), 99 samples representing 11 standard varieties of durum wheat produced in western Canada, 1935–37, were milled into semolina and macaroni produced therefrom. Only Arnautka, Mindum, and Akrona produced macaroni of satisfactory commercial quality with a reasonable degree of consistency over the period. Weight per bushel and semolina yield were governed chiefly by environment, whereas protein and carotene were influenced more by variety. Significant positive intervarietal correlations were obtained only between wheat protein and semolina protein, wheat carotene and macaroni carotene, and semolina carotene

and macaroni carotene. Negative intervarietal correlations were found between wheat protein and wheat carotene and between semolina protein and semolina carotene. The results emphasized that no single analytical factor can be relied upon for the intervarietal prediction of macaroni quality, and the best index available is the color of finished product. Wheat carotene alone is deemed valueless for the intervarietal prediction of macaroni color.

Relative absorption of nutrients by weeds of arable land, B. N. and L. B. Singh (*Soil Sci., 47 (1939), No. 3, pp. 227–235*).—Analysis of *Chenopodium album, Argemone mexicana, Launaea nudicaulis,* and *Oxalis corniculata,* with special attention to the concentrations of different essential elements at successive stages, showed that the absorption per plant increases throughout the life cycle, with decline in rate during the latter part. Gain in absorption per plant attains the maximum at preflowering, considered the stage of maximal absorption. At this stage for all weed species the different elements are absorbed in different quantities. On this basis the weed species were arranged into three groups. The group of weeds rich in nitrogen is the largest, weeds rich in calcium intermediate, and weeds rich in potassium the smallest. Most members of a family possess a greater affinity for a particular ion than for other ions, especially when individual genera are considered.

Relation of root reserves to control of European bindweed Convolvulus arvensis L., A. L. Bakke, W. G. Gaessler, and W. E. Loomis. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul. 254 (1939), pp. 113–144, figs. 7*).—Analyses of material collected from experiments involving various treatments showed that the reserves of the bindweed roots consisted largely of sucrose and a dextrin-like compound or group of compounds, while reducing sugars and true starch were less important. Acid hydrolyzable substances were not depleted in starving bindweed roots. Results with lead-precipitable gums were variable. Polysaccharide reserves were rapidly depleted in the surface roots (upper foot) under either fallowing or chlorate treatments. Sugar levels were more nearly maintained, presumably by upward translocation from the lower roots. The maximum percentage of reserves found in roots from 6 to 8 ft. deep were exhausted only after prolonged fallowing. The totals of either top or root growth of bindweed were not large, the maximum weight of roots recorded being 7,200 lb. per acre to a 17-ft. depth. Total sugar and polysaccharide reserves in the roots were less than 600 lb. per acre. Persistence of the plant under fallowing thus seemed due to the small quantity of reserves needed to regenerate new growth and to the slow rate of removal from the lower roots rather than to the presence of unusually large quantities of reserves. Chlorate treatments resulted in an immediate drop in root reserves, suggesting a direct effect upon respiratory rates or other processes in the treated roots. Total nitrogen, which does not decrease with respiration, showed a decline in fallowed plats which paralleled the drop in carbohydrates but increased in the chlorate-treated roots during the first season of treatment. The sucrose and the dextrin-starch series of polysaccharides were shown to be the important carbohydrates of all bindweed tissues in both total quantities and diurnal fluctuations. Analyses of total tissues gave evidence that the gradients of all substances assumed to be available for translocation were negative in every determination, being lowest in leaves, intermediate in stems, and highest in roots.

The worst weeds [trans. title], O. Caron (*Min. Agr. Prov. Québec Bul. 103 (1937), pp. [2]+33, [figs. 44]*).—Forty-four of the worst weeds in the Province of Quebec are described, with control measures.

Did these go thru your grain drill this spring? D. E. Weimer (*Farm Res. [New York State Sta.], 5 (1939), No. 3, pp. 2, 4, figs. 2*).—The content of different

weed seeds found in 49 dealer oats stocks and 40 farmer stocks in 1939 is tabulated. The most prevalent of 27 weeds were wild oats, wild buckwheat, wild mustard, quackgrass, yellow foxtail, and lambsquarters.

HORTICULTURE

[**Horticultural investigations by the Mississippi Station**] (*Miss. Farm Res. [Mississippi Sta.], 1 (1938), Nos. 1, p. 6; 2, pp. 3, 8; 3, p. 2; 2 (1939), Nos. 1, pp. 6, 7, 8, fig. 1; 2, pp. 1, 2, 3, 4, 7, 8, figs. 2; 3, pp. 2, 6, 7; 4, pp. 2, 7, fig. 1; 5, pp. 1, 2; 6, pp. 1, 2, 6, 8, figs. 6*).—Herein are presented general articles on the following subjects: Vol. 1, No. 1, strawberry growing methods, by T. E. Ashley; No. 2, fruit trees, vines, and ornamentals improved by grafting and budding, by S. J. Greer, and depth of surface soil has material effect on black locust growth, by E. G. Roberts; No. 3, tung trees respond to good treatment, by J. C. Robert; Vol. 2, No. 1, February best time for storing graftwood, by W. T. Mallory; Eckles, native apple, recommended for use in State home orchards, by C. H. Ragland; even a light fire is death to seedlings, by Roberts; and better fertilization and varieties—needs of pickle cucumber industry, by W. S. Anderson; No. 2, small fruit culture on State farms, by Ashley; propagation by cleft grafting and whip grafting easily done, by Greer and Mallory; Pontotoc pear named for home orchards, by Ragland; earlier tung income, more permanent trees, by triangular planting, by Robert; and new varieties sweet corn recommended, by C. R. Owen; No. 3, annuals and perennials for sun and shade, by F. S. Batson; springtime in orchard means spraytime; and higher yields from closer spacing of tomatoes for early market, by L. R. Farish; No. 4, pecan bark grafting, by Greer and Mallory, and native shrubs in Mississippi well adapted to home landscape planting, by Batson; No. 5, blueberries for home orchards in south Mississippi, by Ashley; No. 6, peach varieties listed for home orchards of State, by Ragland; summer training of fruit trees, by Ashley; and young- and boysenberries valuable additions to orchards and vineyards, by E. B. Ferris and Ragland.

[**Horticultural studies by the New Mexico Station**] (*New Mexico Sta. Rpt. 1938, pp. 65–67, 70, 71–73, 75, 76, 78, 82–84*).—Included are reports on studies relating to the time of blooming of various fruits; varieties of apples, pecans, tomatoes, chile peppers, sweet peas, spring bulbs, perennials, and other ornamentals and small fruits; time of planting lettuce; production of vegetable seeds; nature of irregular bearing of apples; and the effects of irrigation on the White Grano onion.

[**Horticultural studies by the Rhode Island Station**] (*Rhode Island Sta. Rpt. [1938], pp. 17–20, 24–31, 39, 40*).—Included are brief reports upon the results of studies of the fertilizer requirements of vegetables; strains and varieties of vegetables; staking of tomatoes; effect of hardening tomato plants on yield; use of growth-promoting substances in the propagation of ornamentals; culture of lilies; carbon dioxide assimilation of apple leaves; spray injury to apple leaves; relation of delayed storage and development of storage scald on Rhode Island Greening and Cortland apples; spacing and mulching of strawberries; breeding of blackberries; propagation of blueberries; and the effect of various factors such as fertilizer, moisture, photoperiods, etc., on the quality of celery as indicated by histological examination.

Inspection, certification, and transportation of nursery stock in Kentucky, with a brief report for the year ended June 30, 1938, W. A. Price and H. G. Tilson (*Kentucky Sta. Regulat. Ser. Bul. 17 (1938), pp. 18*).—This contains information as to regulatory activities and requirements.

The growth of plants in water and sand cultures, J. P. MARTIN and C. W. CARPENTER (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *43* (*1939*), *No. 2, pp. 125-132, figs. 2*).—General information is presented on methods, equipment, materials, and economic considerations.

Vegetable variety and strain trials, F. K. CRANDALL (*Rhode Island Sta. Misc. Pub. 1* (*1938*), *pp.* [*2*]+*11*).—The results of trials with tomatoes, cabbage, celery, lettuce, peppers, sweet corn, garden beans, late spinach, and beets are discussed.

Effect of temperature on the rate of deterioration of fresh vegetables, H. PLATENIUS. (N. Y. [Cornell] Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 1, pp. 41-58, figs. 8*).—The rate of deterioration of seven kinds of fresh vegetables was determined for temperatures ranging from 35° to 89° F. When plotted against the temperature, the calculated temperature coefficients followed a logarithmic curve with a break between 50° and 65°. Q_{10} values expressing the rate of deterioration varied not only with different kinds of vegetables but also with different temperature ranges—the highest values always being found at relatively low temperatures. Temporary storage at 35° had no appreciable effect on the subsequent rate of break-down after transfer to higher temperatures. Different temperature coefficients and Q_{10} values were found to depend on whether the rate of deterioration was measured by visible breakdown or by the rate at which sugar depletion occurs in these vegetables. Based on the rate of sugar losses, peas had a Q_{10} value of 27.5 at relatively low temperatures and 1.4 in the upper temperature range.

Fertilizer for cabbage, peas, methods of planting peas, J. A. CAMPBELL (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *No. 7, p. 7*).—At the Truck Crops Substation, Crystal Springs, 1 year's trials indicated that 1,500 lb. of 4-8-4 fertilizer, sometimes supplemented by a side dressing of 200 lb. of nitrate of soda, was the maximum profitable application. Double-row pea plantings yielded about 50 percent more than single-row plantings with the same fertilizer.

Placement of fertilizer for spinach, kale, and collards, M. M. PARKER, R. C. OLIVER, G. A. CUMINGS, W. H. REDIT, and L. G. SCHOENLEBER. (Coop. U. S. D. A.). (*Virginia Truck Sta. Bul. 101* (*1938*), *pp. 1595-1618, figs. 5*).—In studies extending over several years and conducted on three soil types—Sassafras sandy, Elkton silt, and Norfolk sandy loams—it was found that fertilizers placed in narrow bands on the sides of the seed row and below the level of the seed invigorated the germination of collards, kale, and spinach seed regardless of the soil moisture supply. Fertilizers placed in a narrow band directly below the seed were injurious, especially when the soil moisture was relatively low. Fertilizers broadcast several weeks in advance of or immediately prior to planting had very little effect on germination. Those mixed in the row just before planting kale and collards were toxic when moisture was inadequate. The amount of injury to seed germination with unfavorable placements was associated closely with the amount of rainfall directly preceding and following seeding. In the case of less fertile soils, fertilization following germination resulted in a period of comparatively slow growth. The largest yields of spinach and kale were obtained by side placement of fertilizer, while with collards slightly better results followed placement in a narrow band 3 in. directly below the seed.

Effect of temperature upon the rate of elongation of the stems of asparagus grown under field conditions, C. W. CULPEPPER and H. H. MOON. (U. S. D. A.). (*Plant Physiol., 14* (*1939*), *No. 2, pp. 255-270, figs. 5*).—For temperatures between 52.5° and 87.5° F., the relationship between the growth rate and the temperature was found represented by almost straight lines. The rate of total

elongation was approximately doubled with each increase of 18° over a limited temperature range. The rate of increase in height was slow at first, increased rapidly to about 65 cm. in height, and then slowly decreased as the stalks became taller. Growth responses were interpreted in terms of time required to reach different total heights. In a specific stalk, the zone of maximum growth (a short distance below the tip) was found to be a little more sensitive to changes in temperature than regions above or below this zone.

Effects of certain treatments on the carbohydrate reserves of asparagus crowns, L. E. Scott, J. H. Mitchell, and R. A. McGinty (*South Carolina Sta. Bul. 321 (1939), pp. [48], figs. 4*).—Carefully selected crowns of Mary Washington asparagus planted at the Sandhill Substation in January 1930 and treated differentially with respect to fertilizer and cutting were sampled at 15-day intervals from October 3, 1932, to November 1933 and to a lesser extent in 1934 and 1935. The most striking feature was the very high percentage of total sugars present, largely nonreducing sugars in the fleshy roots. At the time of digging, moisture ran about 75 percent and was, in general, negatively correlated with the percentage of available food reserves. Starch was relatively low, seldom exceeding 3 or 4 percent of the dry weight. Total N was more variable, ranging from 0.7 to 2 percent of the dry weight. Hemicellulose was about 3 or 4 percent and crude fiber between 15 and 20 percent on a dry weight basis. The rhizome of the crown was apparently of comparatively little importance as a storehouse for reserve foods.

A comparison of the means of the samples during the 1-yr. period showed no significant differences in the percentages of carbohydrates in the crowns, as related to fertilizer treatments, but the roots from the high N plats were significantly higher in total N. Extension of the harvest season approximately 2 weeks beyond the normal period greatly increased total yields without appreciable reduction in size of spear and without apparent permanent effect upon productive capacity. Fall harvesting, on the other hand, was definitely harmful, resulting in a lower carbohydrate reserve throughout the dormant period and extending through the period of top-growth renewal in the spring. Fall harvesting gave relatively low yields as compared with spring harvesting, due, in large part, to the small size of the spears. In general, the chemical studies suggested the need of maintaining vigorous top growth throughout the autumn to assure maximum production of spears the following spring.

Comparison of methods of applying fertilizer for cabbage, C. B. Sayre (*Farm Res. [New York State Sta.], 5 (1939), No. 3, pp. 9, 10*).—Of different methods of applying fertilizer to cabbage grown in rotation with sweet corn and winter rye, the best results in terms of yield were secured when the fertilizer was applied, at the time of setting the plants, in bands 2.5 in. at each side of the row and from 3 to 4 in. below the surface. The application of 600 lb. per acre of 4–16–4 material produced profitable increments in yield each year. Rainfall during August and September was the most important single factor affecting the yield of cabbage.

Yellow sweet corn hybrids for New York, W. D. Enzie (*New York State Sta. Bul. 686 (1939), pp. 59, pls. 4*).—A total of 48 varieties, all of which have been actually introduced to the seed trade, are discussed as to origin, parentage, time of maturity, yield, quality, detailed plant and ear characters, and value for canning and freezing preservation.

A trial of new varieties of hops for New York, J. D. Harlan (*New York State Sta. Bul. 687 (1939), pp. 8*).—Of seven new varieties of hops tested by the station, Brewer Gold and Bullion were particularly promising, with the first-named variety outyielding any other by a wide margin. Both contained

greater percentages of soft resins, 22.58 percent in Brewer Gold and 26.72 percent in Bullion, than any of the standard American varieties.

Stimulation of germination of dormant lettuce seed by sulphur compounds, R. C. THOMPSON and W. F. KOSAR. (U. S. D. A.). (*Plant Physiol., 14 (1939), No. 3, pp. 567–573, fig. 1*).—Treatment of lettuce seed with dilute aqueous solutions of various chemicals showed that six solutions had marked stimulating effects. These chemicals were thioacetamide, thiourea, allyl thiourea, thiosemicarbazide, ammonium thiocyanate, and potassium thiocyanate. After treatment, the seeds were placed in germination chambers in darkness at from 24° to 26° C. (75.2° to 78.8° F.) and germination recorded after 72 hr. All six materials contained S, but its presence was not the only condition necessary for growth. The results suggested that the presence of C, N, and S in some specific linkage is involved.

Variety and strain trials of Alaska and sweet types of peas for canning in Maryland, C. H. MAHONEY, W. A. FRAZIER, H. A. HUNTER, and A. WHITE (*Maryland Sta. Bul. 425 (1939), pp. 219–234, figs. 4*).—From experiments extending over a period of 5 yr. it was evident that varieties and strains fluctuate from year to year and that testing over several years may be necessary for evaluation. However, in the Alaska group the inherent yielding capacity and quality of most of the strains were about equal. Superlaska, because of slightly greater vigor, slightly outyielded most of the Alaska strains. In a given variety, such as Alaska, there were noted certain differences in maturity dates and in size of the individual peas in the various strains.

Only two of the so-called sweet varieties—Wisconsin Early Sweet and Resistant Gem—were grown all of the 5 yr. Because of their more diverse origin, the sweet varieties differed more sharply, certain varieties proved adaptable to Maryland conditions, and a few produced more shelled peas per acre than did the Alaska type. The most outstanding sweet variety grown in 1937 and 1938 was the Dark Podded Thomas Laxton. This variety, Mardelah, and Pride can apparently be grown successfully on the Eastern Shore of Maryland. There was indicated the fact that the sweet varieties should be harvested at a relatively immature stage to secure satisfactory canning quality. Notes are presented on the number of seeds per pound, seeding rates, and stand of plants in one of the trials.

Canning peas in Wisconsin, E. L. DELWICHE, F. L. MUSBACH, W. B. SARLES, E. TRUOG, J. C. WALKER, and H. F. WILSON (*Wisconsin Sta. Bul. 444 (1939), pp. 24, figs. 7*).—Herein is offered general information relating to the growing of canning peas compiled by a committee of station workers and based on the results of experiments in culture, plant breeding, and disease and insect control.

Relation between fruit size and food supply in the tomato, F. G. GUSTAFSON and H. B. HOUGHTALING (*Plant Physiol., 14 (1939), No. 2, pp. 321–332, figs. 5*).—The results showed that the size of fruits can be increased considerably by increasing the size of the vegetative structure before the time that the flowers are produced. By reducing the number of fruits to one cluster per plant, both the ovaries and mature fruits were greatly increased in size, but the fruits were not increased in proportion to the enlargement of the ovary. An increased leaf area per fruit resulted in larger fruits, but there was a definite limit to the size of the fruit, dependent on variety. There was a significant correlation between fruit size and the number of carpels.

Understocks for fruit trees, E. MAURER (*Die Unterlagen der Obstgehölze. Berlin: Paul Parey, 1939, pp. XII+379, pls. 14, figs. [454]*).—This handbook is designed to assist the nurseryman and fruit grower in the identification and culture of vegetatively increased rootstocks.

Growing fruit trees to withstand drought, W. P. Baird. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, *1* (*1939*), *No. 6, pp. 9, 10*).—Based on studies at the Northern Great Plains Field Station, Mandan, N. Dak., general information is offered on location of sites, cultural practices, use of shelterbelts, species of trees, and other factors that lead to successful fruit growing.

Some investigations on the assimilation of apple leaves, J. G. Waugh. (Cornell Univ.). (*Plant Physiol.*, *14* (*1939*), *No. 3, pp. 463–477, figs. 5*).—Experiments with leaves of 1-year-old McIntosh, Delicious, and seedling apple trees growing in the greenhouse showed that the assimilation of CO_2 by the apple leaf subjected to uniform light intensity, restricted temperature variation, adequate water supply, and a slow, constant rate of air flow is very irregular from hour to hour on certain days and fairly constant on others. It appeared that internal factors must play a significant part in assimilation. There was evidently a transition range over which light intensity and rate of air flow are both limiting factors in assimilation. In general, under fairly uniform external conditions, leaf temperatures of about 38° C. (100.4° F.) apparently resulted in reduced assimilation, as compared with 30°. The critical temperature for assimilation by the apple leaf is believed to be about 35°.

Summer spray program for apples presents many problems, J. M. Hamilton and S. W. Harman (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 3, pp. 1, 11, figs. 3*).—The changing practices in spraying have brought about new problems, such as the removal of spray residues and the use of such materials as wettable sulfur which are less injurious to the tree. The use of newer materials is discussed, with suggestions as to their effectiveness.

Thinning peaches in western New York, H. B. Tukey (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 3, pp. 1, 5, figs. 2*).—Based on investigations conducted over a 3-yr. period in which peach fruits were thinned at different stages of development from full bloom to the final swell of the fruit as it reached maturity, the report is given that thinning at full bloom or when the fruits were 0.75 in. long resulted in an increase in the size of the pit and in the largest and best-colored peaches. All thinning tended to reduce total yield for the season, but early thinning had the least effect. Over the 3-yr. period, early thinning resulted in an increase in the number of blossoms in the light-crop year and in the size and the number of leaves per tree. As a result, there was a larger total yield for the 3 yr. as a whole, in comparison with no thinning or thinning at any of the later stages of fruit development. Thinning in the early stages is said to be more practical than that in the blossom stage.

Boysenberries: How good yields were made by station, T. E. Ashley (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *No. 7, p. 2, fig. 1*).—Of four methods of training compared in a planting established in February 1938, that system which provided two parallel wires 18 in. apart and the lower of which was 24 in. above the soil gave the best results, with 19 plants averaging 10.87 qt. of berries per plant. Suggestions as to culture, fertilizer, picking, and the uses of the fruit are included.

The effect of lime on the low-bush blueberry, F. B. Chandler. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, *35* (*1938*), *p. 477*).—Lime at the rate of 1, 2, 3, or 6 tons per acre for 1, 2, and 3 yr. failed to show any detrimental effects, even where a total of 18 tons was applied. In fact, most of the limed plants showed notable increase in yield. A study of the pH of the soil from the 18-ton plats showed the top inch to be slightly alkaline. A composite sample of the upper 6 in. of soil in the 18-ton plat showed a pH change from about 5 to 6.6.

Results of 47 years of breeding grapes at Geneva, L. M. Van Alstyne (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 3, pp. 3, 4, fig. 1*).—Emphasis is placed, in this résumé, on the use of *Vitis vinifera* as a parent to secure better quality. Over 25,000 seedlings were produced, and of these the majority resulted from controlled crosses with both parents known. Of these seedlings, about 900 have been selected for further trial, and a total of 25 have been given names. Of the 22 varieties now recommended for planting in New York State, 9 were originated at Geneva.

Influence of certain cultural systems upon root distribution of black raspberries, L. Havis. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, *35* (*1938*), *pp. 478–480*).—Part of a plantation established in the spring of 1931 was mulched with straw, and part was clean cultivated. Observations in trenches dug in 1938 in two directions beneath each type of culture showed no significant differences in the depth of rooting in both areas, with roots found to a depth of from 4 to 5 ft. in each case. The lateral distribution of roots was also similar. There was some tendency for fibrous roots to develop just below the mulch and in the partly decomposed material, but to a lesser degree than would occur in apple orchards. The total number of roots was larger under cultivation than under mulch. There was a decreasing gradient in the number of roots of all sizes from the surface foot downward.

Root and crown development of strawberries, C. W. Van Horn, A. L. Schrader, and I. C. Haut. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, *35* (*1938*), *pp. 461–465, fig. 1*).—Observations on the runners produced by Blakemore plants set in March 1937 in the sandy loam near Salisbury, Md., showed well-defined responses to spacing and fertilizer treatments. Plants from thinned rows developed larger roots and crowns as compared with those from matted rows. All early-formed runners developed dry weight of roots at a rapid linear rate during the growing season, but the plants in matted rows slowed down much earlier than did the spaced plants. Fertilizers applied in mid-August or mid-September were effective in increasing the dry-matter content of the roots. The longer continuance of growth of plants in thinned rows, as well as response to fall fertilizers, is believed to contribute to their better fruiting performance.

Distribution of soluble solids in citrus juices, E. T. Bartholomew and W. B. Sinclair. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, *24* (*1939*), *No. 10, pp. 352, 362, 363, 382, 383, 384, fig. 1*).—Separate determinations of the total soluble solids in the stem and stylar halves of individual segments of immature Valencia oranges showed, in many cases, that these solids were more abundant in the stem ends. As maturity advanced, all segments had more total soluble solids in the stylar ends. The same phenomenon was noted in Washington and Thompson Navels and in grapefruit and may help to explain localization of freezing injury where, in certain cases, a single segment showed freezing injury. In analyzing some 1,500 segments there were found cases where a single segment contained as much as 3.5 percent less total soluble solids than certain of its companions. In fruits harvested from the outer portion of the tree it was noted that, irrespective of the position on the tree, the north segments were almost always higher in total soluble solids. The results were not consistent with the interior fruits. Variation was observed in the color of the juice expressed from the stylar and stem halves of individual segments. Observations on Navel oranges collected between December 30 and January 4 showed that the percentage of titratable acid (expressed as citric acid) was in most cases greater in fruits taken from the north side of trees. In similar tests with Valencias harvested in March and April, the soluble solids were highest in the fruits from the south side. In all but one orchard the acid was higher in the fruit taken from the south side.

in Navel fruits of various sizes taken from the packing house in early April there was a gradual increase in concentration of soluble solids as size decreased. The same trend was noted in the case of Valencias collected in May. The results suggest the need of greater care in selecting samples for analysis.

Processing of the macadamia, R. H. MOLTZAU and J. C. RIPPERTON. (Coop. U. S. D. A.). (*Hawaii Sta. Bul. 83 (1939), pp. 31, figs. 13*).—Herein is presented information regarding the drying of nuts, methods of cracking, grading, cooking, storage, etc. In drying tests in which kernels were placed in a series of jars containing sulfuric acid and water mixtures it was found that air drying was not effective in reducing the moisture content to the most desirable percentage for cracking (3.5 percent) when relative humidities were above 60 percent. Nuts placed in a wire-bottomed tray and exposed to the direct rays of the sun were dried to a kernel moisture content of 2.8 percent in 1 week. Kernels dried in the sun or with artificial heat required, for some unexplained reason, a longer cooking time to reach a certain degree of brownness than did air-dried nuts. Cracking, cooking, and taste tests of artificially dried nuts indicated that the final product was of excellent quality even when a temperature as high as 172° F. was employed. A total of five lots, (1) unshelled air-dried nuts in burlap sacks, (2) air-dried kernels in open containers, (3) air-dried kernels in sealed containers, (4) dehydrated nuts in sealed containers, and (5) oven-roasted kernels in sealed containers, were kept at various temperatures. The results indicated that if macadamia nuts were to be kept for more than 3 mo. they should be stored as dehydrated kernels in cold storage and in sealed containers. Cooked kernels deteriorated more rapidly in storage than did dehydrated.

Problems in the storage of cut carnations, M. S. NEFF. (Iowa State Col.). (*Plant Physiol., 14 (1939), No. 2, pp. 271-284, figs. 10*).—Cut blooms stored at 33° F. kept better than those at 40°. Flowers stored without being placed in water were comparable in keeping quality and carbohydrate reserves with fresh blooms. Storage with stems in water was not found desirable because of poorer keeping and loss of carbohydrates. Such blooms lost weight when moved to room temperatures. Good keeping was favored by high humidity. Carnations wilted prior to storing "dry pack" kept better than when stored in a turgid condition. A reduction in turgor pressure rather clearly reduced the rate of maturity.

FORESTRY

Influence of moisture supply on drought resistance of conifers, H. L. SHIRLEY and L. J. MECKEL. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 1, pp. 1-21, figs. 3*).—The relative drought resistance of various lots of conifer seedlings was determined by the Lake States Forest Experiment Station by exposing them to artificial drought produced in a new "drought machine" consisting of an illuminated plant chamber provided with temperature and humidity control in which potted plants resting on a revolving table were exposed to constant wind velocity. The length of time conifer seedlings, potted in sand at 5-percent moisture content, remained alive in the machine was used as a criterion of drought resistance. This was found to be substantially in agreement with the field survival during periods of natural drought of corresponding lots of seedlings. Increased resistance to drought was induced in *Pinus strobus*, *P. resinosa*, and *P. banksiana* seedlings by subjecting them, during the growing period, to moderate soil drought. Such treatment tended to increase root development and restrict top development, but improved resistance did not depend solely on size of root, size of top, or ratio of root to top. Resistance built up in 2-year-old *P. resinosa* by controlled watering was found to persist to a significant degree during the

following season. Severe exposures to soil dryness temporarily weakened the plants, and unless followed by an ample period of recovery rendered them more susceptible to drought. The possibility of using controlled watering as an expedient for improving drought resistance of pine seedlings was demonstrated to be practical by applying this method in a large forest nursery.

The influence of soil nutrients on drought resistance of two-year-old red pine, H. L. SHIRLEY and L. J. MEULI. (U. S. D. A.). (*Amer. Jour. Bot., 26 (1939), No. 6, pp. 355–360*).—Observations on 1-year-old red pine (*Pinus resinosa*) seedlings, grown during their second season in pots or nursery beds supplied with varying amounts of N, phosphate, and water and then subjected to drought-resistance tests under controlled conditions, showed that N applications had markedly reduced resistance. As to water, nursery-grown plants grown without N and watered daily were less resistant than those watered at 3-day intervals. With N, the water effect was obscured because heavy watering leached the N. With no N supplied, an increase in phosphate increased drought resistance. With N present, the beneficial effects of the phosphate persisted, but the optimum combination of N and phosphate was not determined.

Transpiration and physico-chemical properties of leaves as related to drought resistance in loblolly pine and shortleaf pine, C. S. SCHOPMEYER. (U. S. D. A.). (*Plant Physiol., 14 (1939), No. 3, pp. 447–462, figs. 2*).—Placed in the greenhouse in December 1935, vigorous 1-year-old loblolly pine and shortleaf pine seedlings in 2-gal. cans containing Congaree silt loam were submitted, after a period of establishment, to three conditions of soil moisture, (1) adequate for optimum growth, (2) unwatered, and (3) soil allowed to dry to the wilting coefficient then restored to the optimum. Of the two species, the shortleaf pine was known to be more tolerant to dry conditions. With optimum water supply, 30 percent, shortleaf pine had a higher transpiration rate, more total water, higher osmotic pressure, and a greater solute concentration than loblolly pine. Bound water was not significantly different in the two species. At the wilting coefficient, shortleaf pine had a higher transpiration rate, more total water, and lower osmotic pressure than loblolly pine. Solute concentration and bound water were practically the same in both species. Water restoration after drying resulted in more total water, greater osmotic pressure, and higher solute concentration in the shortleaf pine. Bound water decreased in both species when the water supply was restored. Shortleaf pine absorbed more water from the soil and maintained a higher total water content in its leaves than did loblolly, even when soil moisture was limited.

Fire Control Notes, [July 1939] (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, 3 (1939), No. 3, pp. II+38, figs. 8*).—Brief articles are presented relating to technic, equipment, experiences, etc.

DISEASES OF PLANTS

The Plant Disease Reporter, July 31 and August 15, 1939 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 23 (1939), Nos. 14, pp. 225–252; 15, pp. 253–265, fig. 1*).—The following items of interest are included:

No. 14.—A new potato disease resembling "bluestem" and "purple-top" in New York, by P. Decker; late blight and tipburn on potatoes in New York; potato diseases and onion diseases in Massachusetts, by O. C. Boyd; notes on onion diseases in New York, by A. G. Newhall; some reports on diseases of cucurbits, including cucurbit mosaic and bitter flavor, diseases of cucurbits in New York, and severe occurrence of downy mildew in south Georgia; tobacco diseases and the general plant disease situation in Massachusetts, including fruits, vegetables,

ornamentals, by O. C. Boyd; incidence of fruit diseases (parasitic, nonparasitic, virus, and miscellaneous) in Idaho in 1937 and 1938, by E. C. Blodgett; some important diseases of cereals, corn, sorghum, and cowpeas in Oklahoma, by K. S. Chester; rice strawstacks as a source of infection with the black kernel disease (*Curvularia lunata*?), by A. L. Martin; and brief notes on plant diseases (strawberry red stele appears in Connecticut, perithecia of *Venturia inaequalis* still alive in New York, *Verticillium* wilt of peach trees in New York, X-disease on sand cherry in Massachusetts—a correction, bacterial stalk rot of corn found in Kentucky, and bacterial wilt of sweet corn in New York).

No. 15.—Red suture disease of peach reported from Maryland, by E. A. Walker; peach leaf curl incidence in Illinois in 1939, by G. H. Boewe; some reports on apple rust on fruit in Illinois, unusual occurrences of cedar rusts in New York, apple blotch in Illinois, peach viroses in Massachusetts, and red stele of strawberry reported from Wisconsin; spotted wilt of tomatoes in Missouri, by J. T. Middleton and C. M. Tucker; bacterial ring rot of potato in New York, by H. S. Cunningham; reports on bacterial canker of tomatoes and fertilizer injury in Massachusetts, cabbage yellows in New York, *Fusarium* wilt of spinach destructive on Long Island, *Fusarium* wilt of potatoes in Massachusetts, halo blight and *Alternaria* spot of lima beans on Long Island, salt injury to celery and other crops in Massachusetts, and celery diseases in New York; and poor growth of corn following lespedeza, by S. Diachun and W. D. Valleau.

[Phytopathological studies by the New Mexico Station]. (Partly coop. U. S. D. A.). (*New Mexico Sta. Rpt. 1938, pp. 20, 21, 41, 42*).—Brief reports of progress are included on curly top of sugar beets, treatments for chlorosis of various plant species, and *Ozonium* root rot.

***Proceedings of the thirty-seventh annual meeting of the North Carolina* Academy of Science** (*Jour. Elisha Mitchell Sci. Soc., 54 (1938), No. 2, pp. 189, 190, 191, 192, 193*).—The following abstracts of papers are of interest to phytopathology: Host Range Studies With *Bacterium solanacearum*, by T. E. Smith; Some Parasitic Fungi Harbored by Peanut Seed Stock, by M. M. Evans and R. F. Poole; The Rôle of Magnesium in a Chlorosis of Peach, by J. C. Hackney; and Notes on a Bacterial Disease of the Tubers of the Jerusalem Artichoke, *Helianthus tuberosus*, by L. Shanor.

[Plant disease studies by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1938], pp. 23, 36, 37, 40–43, 44, 45–49*).—Brief reports are included on the status of work on diseases of fine turf and turf grasses and their control (snow mold, leaf spot, brown patch, and dollar spot); spray injury on tomatoes; partial soil sterilization with chloropicrin for various crop plants and for weed control; field tomato disease control with fungicides; chemical control of nematodes in tomato greenhouses; chloropicrin treatment of seedbed soil; buckwheat growth retardation by chloropicrin in culture solutions; response of eggplants to field soil fumigation with chloropicrin; onion varietal resistance to downy mildew; potato spray tests for disease and insect control; disease and pest control in *Lilium formosanum*; seasonal development of apple scab; and a serious maple blight associated with a pythiaceous fungus.

Seventeenth annual report of the Canadian Plant Disease Survey, 1937, I. L. Conners (*Canada Dept. Agr., Sci. Serv., Plant Disease Survey Ann. Rpt., 17 (1937), pp. XI+87*).—Following the general sections on new or noteworthy diseases, phenological data, and weather and its influence on plant diseases, specific diseases are taken up under cereal crops, forage and fiber crops, vegetable and field crops, fruit crops, forest and shade trees, and ornamental plants. A host index is provided.

Eighteenth annual report of the Canadian Plant Disease Survey, 1938, I. L. CONNERS (*Canada Dept. Agr., Sci. Serv., Plant Disease Survey Ann. Rpt., 18 (1938), pp. XII+112*).—Following general sections on new or noteworthy diseases, phenological data, and weather and its influence on plant diseases, specific diseases are taken up under cereal crops, forage and fiber crops, vegetable and field crops, fruit crops, forest and shade trees, and ornamental plants. A host index is provided.

A new fungus with anteriorly uniciliate zoospores: Hyphochytrium catenoides, J. S. KARLING (*Amer. Jour. Bot., 26 (1939), No. 7, pp. 512–519, figs. 18*).—*H. catenoides* n. sp. (described and illustrated) was found as a weak parasite and saprophyte in trichomes and parenchyma cells of corn and in cooked internodes of *Chara* and *Nitella*.

On the systematic position and generic names of the gram negative bacterial plant pathogens, W. J. DOWSON (*Zentbl. Bakt.* [*etc.*], *2. Abt., 100 (1939), No. 9–13, pp. 177–193*).—Examination of the cultural and biochemical characters as exhibited by a large number of the gram-negative bacterial plant pathogens on a variety of media led the author to conclude that the plant pathogens could be arranged in three groups, one like *Bacterium coli*, a second like *Pseudomonas fluorescens*, and a third unlike either for which the name *Xanthomonas* n. g. is proposed. The salient characters of the three genera and lists of the species included in them are given in tabular form, the species mentioned being those studied by the author together with other gram-negative plant pathogens that have been fully described elsewhere. There is a copious bibliography.

Osmotic and permeability relations in the nutrition of fungus parasites, F. S. THATCHER (*Amer. Jour. Bot., 26 (1939), No. 6, pp. 449–458, figs. 11*).—The fungi used in this study were *Uromyces fabae* on pea, *U. caryophyllinus* on *Dianthus caryophyllus*, and *Botrytis cinerea* and *Sclerotinia sclerotiorum* from decaying celery petioles. Osmotic values were obtained for germ tubes and haustoria of the rusts, for hyphae of *Botrytis* and *Sclerotinia*, and for diseased and healthy tissues of the hosts—in all cases greatest for the fungus. Permeability measurements in diseased and healthy tissues of rusted plants indicated that rust increases the permeability of the host plasma membranes. Absolute permeability values for water, urea, and dextrose were calculated by Scarth's simplified formulas (E. S. R., 81, p. 346). This increase was apparently due to some secretion from the fungus as indicated by tests with juice extracts of tissues containing its hyphae. Increased permeability was also apparent in celery tissues some distance from the cells killed by the fungi. A theory based on the results reported is elaborated to explain the mechanism of transfer of food and water from host cells to parasite as manifest in these rusts, permitting an explanation of how cells are able to remain alive even though continually taxed by the parasites. Light is also thrown on other hitherto unexplained phenomena.

Danger in seed importation, H. P. BARSS. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 12, p. 939*).—The author lays stress on the general danger of introducing plant diseases into the United States through seed importations, noting especially a new cotton anthracnose (*Colletotrichum* sp.) recently reported as occurring in Manchukuo.

Snow-mould of turf in Alberta, W. C. BROADFOOT (*Jour. Bd. Greenkeeping Res.* [*England*], *5 (1938), No. 18, pp. 182, 183*).—The conditions favorable and unfavorable for turf in Alberta are discussed, and it is stated that when the snow cover melts slowly, too early, or too often in spring or early winter the growth of parasitic low-temperature fungi, such as the *Fusarium nivale* causing

snow mold, is favored. *Fusarium* spp., a basidiomycete, and *Rhizoctonia* sp. were isolated from diseased crowns and roots of grasses in golf greens, and the first two proved fairly pathogenic and the last only slightly so. Trials of calomel and mercuric chloride for snow mold led to the recommendation of equal parts of these fungicides to be applied in the fall at the rate of 4 oz. per 1,000 sq. ft.

Boron deficiency symptoms in the genus Brassica, F. B. CHANDLER. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 549*).—An abstract.

Bacterial wilt and soft rot of the potato in Maine, R. BONDE (*Maine Sta. Bul. 396 (1939), pp. 675–694, figs. 4*).—The bacterial wilt and soft rot (probably due to *Phytomonas sepedonica*) recently described from Maine (E. S. R., 77, p. 349) is reported as becoming of major importance in some parts of the State, losses being estimated at $32,000 in 1937 and nearly $80,000 in 1938. The disease is apparently not soil-borne in Maine, but is perpetuated in the seed tubers. Increase in the field is often very rapid and seed stocks with only a trace may develop a high percentage the following year. Experiments have demonstrated dissemination in the field, but the spread is not extensive beyond the first row, though more down a hillside slope. Contamination of freshly cut tubers from affected ones will spread the disease. Seed tubers bruised and contaminated before winter storage developed the disease in 7.6 percent of the progeny, while similar tests of unbruised tubers gave only 1 percent. A knife contaminated from an infected tuber was found capable of transmission to the fifth successive seed piece cut thereafter. The amount of such infection was reduced by drying the seed quickly after cutting. The disease was controlled neither by careful examination during cutting nor by roguing and seed plat methods, but the amount was reduced by planting whole tubers. The only known practical method of control is by exclusive use of healthy seed. Planting of seed plats in proximity to affected potato fields should be avoided.

Virus diseases of potatoes [trans. title], L. GARBOWSKI (*Bibliot. Puławska, Państ. Inst. Nauk. Gosp. Wiejsk. Puławach. No. 18 (1938), pp. [4]+98, pls. 6*).—A monograph of the subject (97 references).

Pythium root rot of sugar cane in Louisiana, C. W. CARPENTER (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 43 (1939), No. 2, pp. 115–118*).—A review of salient points regarding the *P. arrhenomanes* root rot, stressing its importance to sugarcane production in Hawaii and quoting the summary of studies by Rands and Dopp (E. S. R., 80, p. 500).

A description of certain nutrient deficiency symptoms of the Porto Rico sweetpotato, J. B. EDMOND and H. J. SEFICK. (S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 544–549, fig. 1*).—Experiments were set up to study the relative effects of a complete nutrient supply as compared with various deficiencies. As to the tops of the plants, a lack of N, P, or K had a much greater influence in reducing growth than a lack of Mg or Ca. With respect to the fleshy roots, plants lacking Ca produced a small number of moderately large roots, and those without Mg the reverse. Plants with complete nutrient or minus P produced a small number of moderately small roots, those minus N a large number of small roots, and those minus K a small number of exceedingly small roots, the last effect, particularly striking, indicating that a continuous supply of K is not only necessary for developing a large number of roots but also for developing large sized ones. As to color of skin and flesh, three groups were evident—the minus N plants produced roots with dark-pink skin and pink flesh, the complete nutrient, and the no Ca or no Mg ones produced roots with light-pink skin and flesh, and the no P or no K plants pro-

duced roots with creamy white skin and flesh. It seems evident that the proportion of N to other nutrients and particularly to K has an important bearing on the color of the skin and flesh.

Oat nematodes on winter wheat, L. J. Chapman (*Sci. Agr., 18 (1938), No. 9, pp. 527, 528, pl. 1*).—This reports a serious outbreak of injury by *Heterodera schachtii* on winter wheat sown in infested soil.

Diseases of vegetable crops, J. C. Walker (*Ann Arbor, Mich.: Edwards Bros., 1939, pp. [3]+67*).—This is the first revision of the work previously noted (E. S. R., 77, p. 801).

Progress in breeding cucumbers resistant to scab (Cladosporium cucumerinum), R. M. Bailey. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 645, 646*).—Continuing the work earlier noted (E. S. R., 74, p. 340), this is a brief progress report.

Calcium cyanamide as a crown treatment, G. R. Hoerner (*Pacific Hop Grower, 5 (1938), No. 11, p. 7*).—From 52 replies to a questionnaire sent to hop growers in British Columbia, California, and Oregon, it appeared that in general when calcium cyanamide was used as a crown treatment for downy mildew control according to directions (2 oz. before hoeing applied to the soil surface over the crown in a circle approximately 2 ft. in diameter, avoiding replants) little injury resulted, the development of basal spikes was suppressed, and increases in yields were secured.

A trace element deficiency on the tomato, J. B. Hester (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 744–746, fig. 1*).—The symptoms described were apparently entirely different from others previously reported. For the most part they were induced in water or sand culture, boron alone or in combination apparently being the only corrective treatment. It is deemed possible that only a partial deficiency existed, which may have been associated with other elements absorbed by the plants from the soil which had not been present in former studies. While only one or two cases were noted in the field during the past season, it may be more common than is expected. It is emphasized that extreme care should be exercised in applying trace elements to tomatoes.

Control of tomato leaf mold in greenhouses, E. F. Guba (*Massachusetts Sta. Bul. 361 (1939), pp. 36, figs. 7*).—This compendium (56 references) presents descriptions of various practices contributing to the control of *Cladosporium fulvum* leafmold, a serious foliage disease of greenhouse tomatoes, and includes the results of work by the station. Successful control is said to involve cultural practices, greenhouse management, location and design, and the use of chemicals for disinfecting the greenhouse interior and protecting the plants from infection. These factors are discussed in detail.

***A recurrence of broomrape, Orobanche ramosa L., on tomato plants in* California,** G. L. Stout (*Calif. Dept. Agr. Bul., 27 (1938), No. 2, pp. 166–171, figs. 4*).—The author reports an outbreak of parasitism on tomato in 1929, and a recurrence on this host in 1934 after the field had been in alfalfa for at least three of the four intervening years. Again other crops were grown on the infested soil, but in 1937 the pest reappeared when tomatoes were planted. It seems apparent, in this case, that the tomato is a highly favored host.

The work of others is briefly reviewed, including presentation of a list of 29 hosts said to be liable to attack.

The influence of bordeaux spray on the growth and yield of tomato plants, V. G. Shutak and E. P. Christopher. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 747–749*).—The data presented "seem to support the claim that bordeaux retards ripening to some extent but may control disease sufficiently well to increase the total yield during some seasons. It is also defi-

nitely indicated that high-lime bordeaux should be avoided and that high-copper bordeaux may be safely and satisfactorily used. Our observations indicate that the injury from lime must be considered along with possible copper injury."

The influence of sulphur dust on the rate of photosynthesis of an entire apple tree, A. J. Heinicke. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 202–204*).—Using the methods and equipment previously described (E. S. R., 77, p. 483), this study indicated that finely divided sulfur dust, as compared to lime-sulfur solution, has relatively little influence on the photosynthetic rate of the leaves of an entire Baldwin apple tree. Even though sulfur dust may cause some leaf scorch in extremely hot weather, this injury is usually much less than where lime-sulfur has been used.

The effect of dilute liquid lime-sulphur sprays on the photosynthesis of apple leaves, H. W. Brody and N. F. Childers. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 205–209, figs. 4*).—It is deemed evident from this brief report that dilute lime-sulfur sprays may cause marked reductions in the apparent rate of photosynthesis of Stayman Winesap apples for 3–5 days after application, even though no visible burning occurs. It also seems evident that when the maximum temperature reaches 90°–100° F. a significant reduction in assimilation usually occurs regardless of the spray concentration in contact with the leaf tissues. In these experiments the photosynthetic rate (three exceptions) of sprayed leaves showed a reduction on the first day after treatment. Otherwise the reduction in assimilation occurred not later than the second day following application.

The effect of copper compounds applied to spur units during bloom upon the set of apple fruits, L. H. MacDaniels and E. M. Hildebrand. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 230–233*).—In spite of the known toxicity of copper compounds to pollen germination, their use has failed to give the expected results in reducing the fruit set, the explanation probably being related to the location of the pollen grains on the papillose stigma with respect to the grains of copper-lime dust and the failure of the spray to cover the stigmatic surface completely. This study emphasizes the very complex nature of the setting process and the many factors involved. From the standpoint of practice the results presented give further weight to the statement that these copper compounds (copper-lime dust and bordeaux mixture) may be applied to blooming apple trees without seriously reducing the fruit set.

An apple leafspot associated with Fabraea maculata, M. C. Goldsworthy and M. A. Smith. (U. S. D. A.). (*Phytopathology, 28 (1938), No. 12, p. 938*).—In addition to parasitizing the leaves of pear seedlings, this fungus was observed to cause similar leaf spots on French crab and McIntosh apple scions grafted on various rootstocks.

A case of rosette on apple in Virginia, H. W. Ridgway (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 227–229, fig. 1*).—This is a description of a case responding to zinc therapy, the preliminary data being presented since zinc deficiency is said not to have been previously reported from apple districts east of the Rocky Mountains.

Some associated factors in the development of watercore, C. P. Harley. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 435–439, fig. 1*).—In the initiation of water core, aside from the fundamental influence of high temperature, leaf area appeared to play a very important role, since in no case was water core found in fruits grown with 10 leaves per apple although their exposure to the sun was at least as great as those with a larger number of leaves, where it occurred in greater or less amounts. Next in importance was nitrogen, the highest percentage of water core for a given leaf area being

found in the nitrated plats. The influence of moisture was not as clear, though for the most part more affected fruits were present in the "dry" plats. The results here reported from Wenatchee, Wash., are believed to offer evidence that factors intimately connected with carbohydrate metabolism in the leaf are predisposing to water core.

Physiological studies in lime-induced chlorosis, Y. Milad (*Egypt. Min. Agr., Tech. and Sci. Serv. Bul. 211 (1939), pp. [3]+56, pls. 7, figs. 3*).—A case of lime-induced chlorosis in pear trees, occurring on soils containing ±15–40 percent $CaCO_3$, was studied in detail and is described. Less Fe was found in the ash of stems and leaves of affected trees than in normal green trees on noncalcareous soils, and the chlorotic leaves showed a higher content of Ca and Mg. The susceptibility of pear, apple, white lupine, and rice to chlorosis on calcareous soils was found to be related to a relatively slow rate of CO_2 production from their root systems, while sunflower, buckwheat, cotton, corn, and barley, which did not develop the chlorosis on such soils, gave a much higher rate of CO_2 from their roots than the first group. The importance of CO_2 in increasing the solubility of Fe in lime soils was shown by quantitative analysis, and it proved possible to prevent chlorosis in lupines growing in suspensions of calcareous soils by applying Co_2. The part played by CO_2 given off by roots in increasing Fe availability in calcareous soils is suggested as due (1) to lowering the pH of the soil solution around the root hairs and rootlets, and (2) to acting as a solvent for $FeCO_3$ which might form in the lime soil from reduction of ferric oxides in the presence of organic matter and excessive moisture.

Variation in resistance to brown rot in apricot varieties and seedling progenies, C. O. Hesse. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 266–268, fig. 1*).—The springs of 1935 and 1938 having been especially favorable to brown rot development in central California at the time apricots were in bloom, the trees in the variety block at Davis were rated as to relative resistance. Similar ratings were also made in a large seedling block. The readings for the 2 yr. in the variety block checked very closely. Though not conclusive, the results were deemed of value in indicating the relative resistance to brown rot of the different varieties and their general behavior in transmitting resistance.

Bacterial canker of sweet cherry trees, D. T. Palmiter (*Farm Res. [New York State Sta.], 5 (1939), No. 3, p. 6, figs. 2*).—This disease was first noted during the spring and summer of 1938 in the Hudson Valley, but has since been reported in western New York and Pennsylvania. It was found to be similar to if not identical with the serious disease of cherry known on the Pacific coast and in Europe for many years. Besides the trunk and limb cankers, blossom blight and leaf spot phases may appear in moist weather and terminal shoots may become infected and die back to older wood. The cankers are most active while the trees are dormant, the disease being favored by mild winters and rainy weather. Windsor appeared to be the most resistant variety in 1938, and Giant the most susceptible. With present knowledge, removal of diseased branches during the growing season and prevention of early defoliation to shorten the dormant period are the only control measures recommended.

The effect of potash on leaf-curl of sour cherry, L. R. Langord. (Univ. Wis.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 261, 262, fig. 1*).—With respect to the leaf curl of cherry previously reported (E. S. R., 75, p. 650), subsequent trials have shown that affected trees fertilized with potash had less leaf curl and greater shoot growth than comparable trees without it.

Symptoms of malnutrition in the peach resulting from various combinations of nutrient deficiencies, O. W. Davidson. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 87, 88*).—An abstract.

First progress report on prune drouth spot, A. B. BURRELL and R. M. HEINICKE. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 275–278, fig. 1*).—As a phase in the study of the so-called drought spot of prune, mineral nutrient plats were laid out in three western New York State prune orchards. The materials applied were borax, $(NH_4)_2SO_4$, K_2SO_4 and superphosphate, $CuSO_4$, $ZnSO_4$, $MnSO_4$, and $FeSO_4$. In 1938 only one of these orchards had an appreciable amount of drought spot, and the only plat with consistently less of it than adjacent controls was the one receiving K_2SO_4 and superphosphate. Whether this difference was due to the treatment or to accident further tests alone will show.

Prevalence of certain diseases affecting the foliage in some strawberry progenies, J. H. CLARK. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 455–460*).—Certain data secured in connection with the strawberry breeding projects are here summarized with respect to leaf scorch (*Diplocarpon earliana*), powdery mildew (*Sphaerotheca humuli*), and June yellows.

Deficiency symptom patterns in citrus, O. C. BRYAN (*Citrus Indus., 19 (1938), No. 3, pp. 11–15, figs. 2*).—Following a brief general discussion the author presents synopses of deficiency symptoms for Mg, Zn, B, N, Fe, K, Ca, Mn, P, and Cu—all but the last two being also illustrated.

Some symptoms of citrus malnutrition in Florida, A. F. CAMP and B. R. FUDGE (*Florida Sta. Bul. 335 (1939), pp. 55, pls. 8, figs. 11*).—Research revealing the specific relationship between nutritional requirements and certain symptoms exhibited by the citrus tree has furnished the basis for using these symptom expressions on leaves, twigs, and fruits as guides to fertilization. In this bulletin—intended as a reference work—the authors endeavor to bring together the gist of the pertinent information now available (196 references) on Cu, Zn, Mn, Mg, N, Fe, and B deficiency and on B toxicity in relation to citrus, with illustrations in color of the more common symptoms of these types of malnutrition as observed in Florida. A number of other symptom complexes apparently due to malnutrition are briefly noted.

Manganese deficiency in citrus in Florida, A. F. CAMP and M. PEECH. (Fla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 81–85, fig. 1*).—"Manganese deficiency symptoms on citrus as they occur in the field in Florida were found to resemble the symptoms of zinc deficiency as to leaf pattern but much less pronounced. It can be corrected both by applications of manganese salts to the soil and to the leaves. Its occurrence on both acid and alkaline soils is discussed in relation to the soil analysis."

A new disease of papaya in Hawaii, G. K. PARRIS. (Hawaii Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 263–265, figs. 3*).—This disease was first noted in 1937, with losses estimated at 6–30 percent. Investigations, begun in 1938 and here reported in a preliminary way, appear to indicate its virus nature. Affected plants are badly stunted, the foliage is characteristically yellowed, and the individual leaves are crinkled and at the same time bent downwards and inwards. The symptoms are described in detail and illustrated.

The effect of root-knot upon the subsequent growth of tung-oil (*Aleurites fordi*) seedlings, R. D. DICKEY and H. MOWRY. (Univ. Fla.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 389–392, figs. 2*).—"It is clearly indicated that tung-oil seedlings are highly susceptible to attack by the root knot nematode their first growing year in the nursery, whereas these same seedlings, when planted in the field at 1 yr. of age or older, are apparently quite resistant if not immune. Furthermore, severely affected seedlings when planted in the field show no further infestation and eventually grow out of any evidence of the previous infestation, as far as the root system is concerned. The effect of the

nematode root knot attack has been such as to weaken the vigor of the seedling trees, and subsequent exposure to low temperatures resulted eventually in the death of 8 of the 19 trees. Also, nursery stock which has become stunted from any cause will ordinarily fail to grow into vigorous field trees and for that reason should not be planted."

Symptoms of boron deficiency in the rose, O. W. Davidson and H. M. Biekart. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 841–844, figs. 2*).—In September 1938, Briarcliff roses in a demonstration test developed a type of injury believed not to have been described before and diagnosed as due to boron deficiency. The symptoms on the leaves, preflowering stems, and flowers are described in detail, with notes on a "meager study" of the effects on composition of the plants.

Downy mildew of the rose in British Columbia, W. Jones (*Sci. Agr., 18 (1938), No. 10, pp. 627, 628, fig. 1*).—This note reports considerable injury by *Peronospora sparsa* to the varieties Portadown and Lord Lonsdale, and slight infection on the varieties Mrs. Gladys Peach, Mrs. H. Morse, Mrs. Laxton, Lal, Crimson Glory, Trigo, and Mrs. C. Lamplough. The leaves, stems, and flowers were affected.

Control of snapdragon rust (Puccinia antirrhini D. & W.), W. R. Foster (*Sci. Agr., 18 (1938), No. 9, pp. 524–526, pl. 1*).—Copper sprays proved more effective than sulfur for control in the British Columbia coastal areas, bordeaux (4–4–50) plus a spreader (agral 2, lethelate, or penetrol) being effective preventatives on plants grown for seed. Only two applications of bordeaux were needed (1936–37) to protect the seed crop, since spraying after opening of the flowers is not necessary in such cases. Bouisol, Bordinette, Copper hydro, and Burgundy mixture, with agral 2 as a spreader, all gave sufficient protection on plants grown for seed to warrant their trial on those grown as ornamentals.

Rubber blocks and wax for tree repairs: A new method to check decay, J. Doherty (*Florists Exch. and Hort. Trade World, 92 (1939), No. 5, p. 10, figs. 3*).—The new process makes use of rubber blocks as "sutures" followed by application of boiling wax used in the manner of dental "amalgam."

A decade of research in forest pathology, C. Hartley. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 9, pp. 908–912*).—This is a review of research in the United States on seedling and plantation diseases, diseases in forests, naturalized diseases, decay of logging slash, and deterioration of killed timber and forest products. The present status and prospects for the future are also briefly discussed.

Dodder damages black locust seedlings at a Pennsylvania nursery, L. W. R. Jackson and F. Kaplan. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 7, p. 712*).—Note on an outbreak of *Cuscuta arvensis* infestation on *Robinia pseudoacacia* seedlings, apparently brought in with clover seed.

Arsenate injury to black locust caused by drift, H. C. McNamara (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 7, p. 1*).—A note reporting leaf drop and resulting reduction in growth of trees due to drift of calcium arsenate dusted by airplane for cotton bollweevil control.

Septoria canker of introduced and native hybrid poplars, J. E. Bier (*Canad. Jour. Res., 17 (1939), No. 6, Sect. C, pp. 195–204, pls. 5*).—It was found that in addition to leaf injury, *S. musiva* induces cankers on certain introduced poplars (*Populus rasumowskyana, P. petrowskyana*, and *P. berolinensis*) and the native hybrids Northwest and Saskatchewan. Field observations and inoculations demonstrated that most of the inoculum for spring infection comes from ascospores of a *Mycosphaerella* stage, and that the fungus enters the stems

through mechanical wounds, uninjured lenticels, leaf petioles, or stipules. Incipient cankers occur in the bark of the current season's wood, soon girdling both leading and side shoots. The cankers later spread from lateral branches to the main stem, developing into perennial cankers which ultimately girdle and kill the trees.

Laboratory tests of wood preservatives, J. Leutritz (*Sci. Mo., 46 (1938), No. 6, pp. 576-579, figs. 4*).—The method described involves the impregnation of small blocks of wood with the preservative under test, and their exposure in separate glass jars to the action of different fungi. After several weeks the effectiveness is rated on the amount and density of fungus growth, the decrease in weight of the samples, and their loss of mechanical strength. The untreated controls are valuable as indicators of the nature of the preservative from the standpoints of solubility, volatility, and chemical stability, and particularly of the strength lost by the treated blocks.

ECONOMIC ZOOLOGY—ENTOMOLOGY

George Henry Falkiner Nuttall, 1862–1937 (*Parasitology, 30 (1938), No. 4, pp. 403–418, pl. 1*).—This biographical sketch is followed by a list of 180 scientific publications by G. H. F. Nuttall, issued from 1886 to 1938, inclusive.

Directory of field activities of the Bureau of Biological Survey, 1939 (*U. S. Dept. Agr., Misc. Pub. 343 (1939), pp. II+117, figs. 3*).

Conservation of wildlife, W. J. Hamilton, Jr. (In *Conservation in the United States. Ithaca, N. Y.: Comstock Pub. Co., 1939, pp. 259–345, figs. 40*).—This discussion relates to conservation of fish and fisheries (pp. 261–293), game and fur resources (pp. 294–327), and of other useful wildlife (pp. 328–345).

Wildlife food strip planting (*Rhode Island Sta. Misc. Pub. [2] (1939), pp. [1]+3, fig. 1*).—A practical account.

Legumes: Their erosion-control and wildlife values, E. H. Graham (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, SCS-TP-23, pp. [4]+102*).—Following introductory accounts, this work presents an alphabetical annotated list of legumes which serve as food for wildlife (pp. 17–65), and an annotated list of birds (pp. 66–74) and of mammals (pp. 75–82) with the legumes they utilize. A list of 159 references to the literature cited and an index to legume names are included.

The problem of wildlife destruction by automobile traffic, L. M. Dickerson (*Jour. Wildlife Mangt., 3 (1939), No. 2, pp. 104–116, figs. 4*).

Annotated list of Tennessee mammals, R. Kellogg (*U. S. Natl. Mus. Proc., 86 (1939), No. 3051, pp. 245–303*).—This annotated list of mammals of Tennessee is presented with a list of 44 references to the literature cited.

A census of red foxes and striped skunks in Clay and Boone Counties, Iowa, T. G. Scott and L. F. Selko. (Iowa Expt. Sta.). (*Jour. Wildlife Mangt., 3 (1939), No. 2, pp. 92–98*).

Fall and winter food habits of Vermont bobcats, W. J. Hamilton, Jr., and R. P. Hunter. (Cornell Univ. et al.). (*Jour. Wildlife Mangt., 3 (1939), No. 2, pp. 99–103*).—Identification of the stomach contents of 140 bobcats (*Lynx rufus rufus*), taken in Vermont from fall to late winter over a 3-yr. period, is reported upon. The findings indicate that the chief food of the bobcat consists of deer (much of which is carrion), mice, chiefly *Microtus* and *Peromyscus*, varying hares and cottontails, porcupines, squirrels, and grouse. "Shrews, muskrats, carrion, and blue jays were eaten less frequently. Such items as red and gray foxes, grass, poultry, fish, mink, and insects are also included in the winter dietary of the bobcat."

Central Wisconsin muskrat study, F. N. HAMERSTROM, JR., and J. BLAKE. (Univ. Wis. et al.). (*Amer. Midland Nat., 21 (1939), No. 2, pp. 514–520*).—A list of food plants of the muskrat in central Wisconsin.

Rat surveys and rat proofing, B. E. HOLSENDORF (*Pests, 7 (1939), No. 6, pp. 10–12*).

Sanitation in fur farming: The use of disinfectants and insecticides in insect and disease control, R. LAW (*Soap, 15 (1939), No. 2, pp. 93, 95, 117*).

The migration of American birds, F. C. LINCOLN (*New York: Doubleday, Doran & Co., 1939, pp. XII+189, pls. 12, figs. 22*).—In the preparation of this work, in addition to the original investigations in the field by the author and the extensive accumulations of data contained in the files of the U. S. D. A. Bureau of Biological Survey, free use was made of the writings of many others. Following an introduction and brief historical account, consideration is given to the origin and mechanics of, influence of the weather on, dangers in, times of, and distances covered in, migration; pelagic and vagrant migration; bird banding; evolution of migration routes; and the flyway systems.

Studies of breeding birds in the Allegany State Park, A. A. SAUNDERS (*N. Y. State Mus. Bul. 318 (1938), pp. 160, figs. 77*).—Forty-one species of birds found breeding in the Allegany State Park during a period of 12 summers for the months of July and August are reported upon.

The birds of Antigua, S. T. DANFORTH. (Univ. P. R.). (*Auk, 51 (1934), No. 3, pp. 350–364*).—In reporting further upon studies of birds in the West Indies (E. S. R., 81, pp. 669, 670), the author considers 61 species observed in Antigua, of which 42 were actually collected. As a result of the work 20 species previously unrecorded from the island are added to its known avifauna, bringing the total list of birds known from Antigua to 81, exclusive of 6 that have been doubtfully recorded and are listed hypothetically.

Supplement to "The birds of Antigua," S. T. DANFORTH (*Auk, 56 (1939), No. 3, pp. 304, 305*).—In this supplemental annotation, 6 species are added to the definitive list, making a total of 87 recorded from Antigua.

Geese and ducks of the world, N. KURODA (*[Tokyo: Shukyosha], 1939, pp. [223], pls. 121*).—Two hundred and thirty-two species and varieties of ducks and geese of the world, representing 13 subfamilies, are dealt with in this work, which is in Japanese.

Comparison of the food of white-necked ravens and crows in Oklahoma, R. H. IMLER. (U. S. D. A.). (*Wilson Bul., 51 (1939), No. 2, pp. 121, 122*).

Winter losses from starvation and exposure of waterfowl and upland game birds in Ohio and other Northern States, M. B. TRAUTMAN, W. E. BILLS, and E. L. WICKLIFF (*Wilson Bul., 51 (1939), No. 2, pp. 86–104, figs. 8*).—This contribution is presented with a list of 28 references to the literature.

A study of Wisconsin prairie chicken and sharp-tailed grouse, F. N. HAMERSTROM, JR. (*Wilson Bul., 51 (1939), No. 2, pp. 105–120, figs. 2*).—A list of 22 references to the literature cited is included in this contribution.

Studies of the eastern ruffed grouse (Bonasa umbellus umbellus) in Michigan, L. W. FISHER (*Michigan Sta. Tech. Bul. 166 (1939), pp. 46, figs. 9*).—A report is made of studies started in Michigan in 1924 when a National Cooperative Committee was formed to determine what diseases or parasites might be responsible for the sudden decrease in the population of ruffed grouse. Work reported includes the history and distribution of ruffed grouse in Michigan, a description of ruffed grouse census areas, census methods, census data presented at length in tables and charts, habit studies, and some factors studied which determine the abundance of ruffed grouse (namely predators, parasites, and diseases), and control of cover. A summary of the parasitic infestation findings of

more than 300 ruffed grouse collected in the State has revealed the gizzard worm (*Cheilospirura spinosa*) to be the parasite of most common occurrence, with the roundworm (*Ascaridia lineata*) and the eyeworm (*Oxyspirura petrowi*) ranking as close second in the number of infestations. Other parasites were the tapeworm (*Davainea tetraoensis*), the proventricular worm (*Dispharynx spiralis*), the crop worm (*Thominx annulata*), the intestinal fluke, and the blood parasite *Leucocytozoon bonasae*. A bibliography of seven pages is included.

Seasonal movements of a low-density valley quail population, J. T. Emlen, Jr. (Univ. Calif.). (*Jour. Wildlife Mangt., 3 (1939), No. 2, pp. 118-130, figs. 3*).

Increase quail by improving their habitat, V. W. Lehmann (*Austin, Tex.: State Game, Fish and Oyster Comn., 1937, pp. 44, figs. 18*).—This report, based upon field observations conducted since the fall of 1927 in all important quail habitats in Texas and examinations during the fall of 1935 of 2,000 winter quail stomachs collected throughout the State, is presented with a list of 26 references to the literature reviewed.

Additional information on the food of the American woodcock, O. S. Pettingill, Jr. (*Wilson Bul., 51 (1939), No. 2, pp. 78-82*).—This contribution supplements the earlier work noted (E. S. R., 76, p. 211).

Life histories of North American woodpeckers: Order Piciformes, A. C. Bent (*U. S. Natl. Mus. Bul. 174 (1939), pp. VIII+334, pls. 39*).—This is the twelfth in a series of bulletins on the life histories of North American birds (E. S. R., 80, p. 509).

Dispharynx pipilonis, a new spiruroid nematode from the red-eyed towhee (Pipilo erythrophthalmus erythrophthalmus (Linn.)), O. W. Olsen. (Minn. Expt. Sta. et al.). (*Amer. Midland Nat., 21 (1939), No. 2, pp. 472-475, figs. 4*).—Under the name of *D. pipilonis* a description is given of a new species collected from the proventriculus of the red-eyed towhee in Kentucky. A key to the species of the genus which supplements that issued by Cram in 1927 (E. S. R., 58, p. 157) includes five species since described.

Trout streams: Conditions that determine their productivity and suggestions for stream and lake management, P. R. Needham (*Ithaca, N. Y.: Comstock Pub. Co., 1938, pp. X+233, figs. [75]*).—This work includes discussions of predatory animals occurring along trout streams, parasites, stream insects which serve as food, and crustaceans, snails, and clams (pp. 73-112), also a discussion of food selection as shown by trout (pp. 113-126) and the distribution of trout foods (pp. 127-153).

Fifty years of entomology research, J. R. Watson. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 11, pp. 3, 23, fig. 1*).

The role of arrhenotoky in the adaptation of insects, S. E. Flanders. (Calif. Citrus Expt. Sta.). (*Science, 90 (1939), No. 2326, p. 82*).

The nomenclature of categories lower than species, C. W. Sabrosky. (Mich. Expt. Sta.). (*Ent. News, 50 (1939), No. 7, pp. 197-203*).

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1939, E-469, pp. 19; E-470, pp. 17, pls. 9; E-471, pp. 12, pls. 7; E-472, pp. 2; E-473, pp. 13, pls. 2; E-474, pp. 3; E-475, pp. 37, figs. 97; E-476, pp. 6, pls. 3; E-477, pp. 18; E-478, pp. 14; E-479, pp. 11, pls. 8; E-480, pp. 4; E-481, pp. 4; E-482, pp. 11; E-483, pp. 56*).—The following contributions are in continuation of this series (E. S. R., 81, p. 242): Insects of the Castor-Bean, by G. Myers (E.-469); Practical Methods of Mormon Cricket Control, by C. Wakeland, W. B. Mabee, and F. T. Cowan (E-470); Status of White Pine Blister Rust Control on January 1, 1939 (E-471); The European Earwig and Its Control, by C. W. Getzendaner (E-472); A Preliminary Report on the Influence of Stock on Supersedure, or Loss, of Queen Bees,

by C. L. Farrar and C. W. Schaefer (E-473); The Strawberry Weevil and Its Control, by W. A. Thomas (E-474); Keys for the Identification of Some Lepidopterous Larvae Frequently Intercepted at Quarantine, by H. W. Capps (E-475); The Use of Oil for Earworm Control in Sweet Corn, by G. W. Barber (E-476); List of Common Names Used for Species of *Derris* in Connection With Insecticidal Properties, by R. C. Roark (E-477); Recommendations for the Control of Certain Insects Attacking Vegetables, Strawberries, and Raspberries, by W. H. White (E-478); Aids to the Identification of the Mormon and Coulee Crickets and Their Allies (Orthoptera: Tettigoniidae, Gryllacrididae), by A. B. Gurney (E-479); Results of Studies on Diphenylamine As a Wound Protector Against the Screwworm (*Cochliomyia americana* C. and P.) (E-480) and Diphenylamine As a Wound Protector Against the Screwworm (*Cochliomyia americana* C. and P.) (E-481), both by R. Melvin, H. E. Parish, E. F. Knipling, and R. C. Bushland; The Effect on Plants of Methyl Bromide Fumigation in Japanese Beetle Treatment Tests—Preliminary Report, by H. C. Donohoe and V. A. Johnson (E-482); and A Bibliography of *Quassia*, by R. L. Busbey (E-483).

Insect populations (*Ecol. Monog., 9 (1939), No. 3, pp. 259–320, figs. 2*).—Contributions presented in a symposium on insect populations at a joint meeting of the Ecological Society of America, Entomological Society of America, and the American Association of Economic Entomologists at Richmond, Va., in December 1938 are: Insect Population Problems in Relation to Insect Outbreak, by R. N. Chapman (pp. 261–269) (Hawaii. Pineapple Prod. Expt. Sta.); Population Studies of Soil Insects, by K. M. King (pp. 270–286); Populations of Social Insects, by A. E. Emerson (pp. 287–300); Forest Insect Populations, by S. A. Graham (pp. 301–310); and Insect Populations in Relation to Biological Control, by H. S. Smith (pp. 311–320) (Calif. Citrus).

Proceedings Seventeenth Annual Meeting of the North Central States Entomologists (*North Cent. States Ent. Proc., 17 (1938), pp. 17–20, 23, 25–29, 31, 32, 33, 34, 39–43, 55–83, 84–92, 92–96, 96–99, 99–101, 103–106, 107–110*).—Among the contributions presented at the annual meeting held in March 1938 and included in this mimeographed report are: Some Recent Developments of the Locust Borer Problem, by W. L. Baker (pp. 17, 18); Breeding Plants for Resistance to Insects, by G. H. Stringfield (p. 23); Promising New Insecticides Developed by the [U. S. D. A.] Division of Insecticide Investigations, by R. C. Roark (pp. 25–29); Some Interesting Data From a Study of Grassland Insects, by D. A. Wilbur (p. 31); Armyworms—Forecasting, Migrating, Habits, and Control, by W. P. Flint (pp. 33, 34); Insect Hazards and Preventive Measures Possible to Grain Stored on Farms Under the Proposed Ever Normal Granary Plan, by R. T. Cotton (pp. 39, 40); The Corn Borer Situation in the Lake States Area in 1937, by W. A. Baker (pp. 41, 42); Present Status of Corn Borer in Indiana and Work in Progress, by G. A. Ficht (pp. 42, 43); Codling Moth—New Developments on Life History and Control, by C. R. Cutright and G. E. Marshall (pp. 55–57), and Use of Bait Traps as an Extension Project, by G. E. Lehker (p. 58); Oriental Fruit Moth—Parasitism and Infestation, by B. F. Driggers (pp. 59–61), Chemical Control, by M. D. Farrar (p. 62), and Cultural Control, by G. E. Marshall (pp. 62, 63); Tests With Dormant Oil Containing Dinitro-cyclohexyphenol on Peach (pp. 63, 64) and Effectiveness of Ethylene Dichloride at Low Temperatures for Control of Peach Borer (p. 64), both by S. C. Chandler; Control of Flat-Headed Borers, by J. S. Houser (pp. 64, 65); Apple Leafhopper—Life Histories of Important Species, by D. M. DeLong (pp. 65, 66), and White Apple Leafhopper Control, by H. M. Steiner (pp. 66, 67); Recent Developments in Grape Insect Research, by G. A. Runner (pp. 67–69); Biology and Control of

Strawberry Leaf Roller, by R. L. Parker and P. G. Lamerson (Kans. Expt. Sta.) and R. B. Neiswander (pp. 69-72); Control of Climbing Cutworms, by G. A. Ficht and R. Hutson (pp. 72-74); Control of Raspberry Cane Borer and Related Species, by E. L. Chambers (p. 74); Effect of Fruit Tree Removal by W. P. A. on Insect Populations in Commercial Orchards, by F. G. Anderson (p. 75); Safeners for Use With Calcium Arsenate, Zinc Arsenate, and Lead Arsenate in Different Spray Combinations, by H. F. Dietz (pp. 75-77); The Quantitative Approach to the Problems of Plant Resistance to Insect Attack, summarized by L. L. Huber (pp. 78-82); Insect Pollination of Alsike Clover, by W. E. Dunham (p. 83); 4-H Club Work in Beekeeping, by G. E. Lehker (p. 83); Evaluation of Biotic Control, by S. A. Graham (p. 84); Evaluation of Biological Control Through Parasites and Predators and the Relative Importance of Each Group, by A. Peterson (p. 85); Should Our Cultural Practices be Correlated With Biological Control? by L. M. Peairs (p. 85); Should Our Insecticide Program be Correlated With Biological Control? by P. Garman (pp. 85, 86); Some Important Factors in Biological Control, by C. P. Clausen (pp. 86, 87); Possibilities of Biological Control of Greenhouse Insects Thru Natural Enemies, by C. C. Compton and J. H. McLeod (pp. 88, 89); Importance of Continued Surveys To Determine Parasite Effectiveness, by R. B. Neiswander (p. 89); The Present Status of Biological Control of the European Corn Borer, by W. A. Baker (pp. 89, 90) Newer Developments and Present Trends of Research in the Control of Greenhouse Insects, by H. F. Dietz (pp. 90, 91); Thrips and Red Spider and Their Control Under Glass, by C. C. Compton and C. R. Neiswander (pp. 92, 93); Cyclamen Mite and Broad Mite Control in the Greenhouse, by C. C. Compton (p. 93); An Earwig Destructive to Greenhouse Radish, by C. R. Neiswander (p. 94); The Garden Symphylid, by J. S. Houser (pp. 94, 95); Control of Green Bean Pests With Special Reference to Leafhopper, Mexican Bean Beetle, and Red Spider, by N. F. Howard and L. H. Shropshire (pp. 96, 97); The Striped Cucumber Beetle and Wilt Disease, by G. E. Gould (p. 97); Control of Cabbage Insects, by L. H. Shropshire (p. 98); Control Experiments Against the Tarnished Plant Bug, by G. E. Gould (p. 99); Squash Vine Borers, by R. Hutson (p. 100); Control of Tomato Fruit Worm, by L. H. Shropshire and G. E. Gould (pp. 100, 101); Relation of Mosquitoes to Encephalomyelitis of Horses (pp. 103, 104) and Distribution, Importance, and Control of the Sheep Bot Fly (p. 104), both by F. C. Bishopp; Testing of Fly Sprays, by W. A. Simonton (pp. 104, 105); Electric Insect Traps and Screens, by T. H. Parks (pp. 105, 106); Rubberized Fumigating Bags for Individual Articles of Household Furniture, by R. T. Cotton (p. 107); Life History and Habits of Six Species of Cockroaches, by G. E. Gould (pp. 107, 108); A New Ant to Consider in the North Central States—the Crazy Ant (*Paratrechina* [*Prenolepis*] *longicornis*), by W. E. McCauley (p. 108); Proprietary Termite Control Treatments, by J. J. Davis (pp. 109, 110); and A Termite Control Project, by G. E. Lehker (p. 110).

[Contributions on economic insects and insect control] (*Northwest Assoc. Hort., Ent., and Plant Pathol., Moscow, Idaho, 4 (1938), Abs. Papers, pp. 9-12*).—Among the entomological contributions presented at a meeting held in Idaho in July 1938, abstracts of which are included in this mimeographed report, are the following: Progress in the Biological Control of Fruit Insects at Parma, Idaho, by R. W. Haegele (p. 9); Wireworms and Their Control in the Pacific Northwest, by M. C. Lane (pp. 9, 10) (U. S. D. A.); Dissemination of Introduced Insect Pests in Washington, by L. G. Smith (p. 10); Resistance of Winter Wheats to Hessian Fly, by W. R. Foster and C. E. Jeffery (pp. 10, 11); Pea Aphid Populations on Alfalfa and Canning Peas During 1937, by R. D. Eichmann (p. 11) (Wash. Expt. Sta.); Experiments With Phenothiazine, by C. W. Murray (p. 11)

(U. S. D. A.); The Control of the Hairy Spider Beetle (*Ptinus villiger* Reit.) by Means of Poisoned Baits, by W. Downes and H. Andison (pp. 11, 12); The Distribution of Pea Weevil Infestations in the Palouse Area of Northern Idaho and Eastern Washington, by T. A. Brindley and F. G. Hinman (p. 12) (U. S. D. A.); and Field Experiments for the Control of the Beet Leafhopper in Idaho, 1936–37, by J. R. Douglass, C. Wakeland, and J. A. Gillett (p. 12) (U. S. D. A., Idaho Sta., et al.).

[Studies on economic zoology and entomology] (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *Nos. 3, p. 3; 6, pp. 1, 6, 8*).—Brief articles are included as follows: No. 3, Crawfish Control by Simple Treatment, by C. Lyle; No. 6, July Poison for Weevils Is Suggested, by C. Lyle, and Little Danger of Injury From Use of Calcium Arsenate, by R. Coleman.

[Work in entomology by the New Mexico Station] (*New Mexico Sta. Rpt. 1938, pp. 45–55, figs. 7*).—The work of the year referred to (E. S. R., 79, p. 76) includes codling moth investigations, namely, (1) relation of bacteria to fermentation and attractiveness, (2) attractancy of chemicals isolated from fermenting baits and their comparison with members of homologous or related series, (3) improvements in trap design and manipulation, and (4) comparison of insecticides used as supplements for lead arsenate in summer cover spray; and further tests with soil insecticides for control of subterranean larvae of the California prionus.

[Work in entomology by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [*1938*], *pp. 20, 23*).—Brief reference is made (E. S. R., 79, p. 504) to the treatment of early cabbage plants with corrosive sublimate to protect them from root maggots, the use of rotenone for the control of the green cabbageworm on cabbage and cauliflower, and control of the webworm by the application of arsenate of lead.

[Contributions on economic insects] (*Wash. State Hort. Assoc. Proc., 34* (*1938*), *pp. 7–13, 31–33, 123–140, 144–149, figs. 6*).—The contributions on economic entomology presented at the thirty-fourth annual meeting of the Washington State Horticultural Association held at Yakima, Wash., in December 1938 are: Progress in the Mite Control, by R. L. Webster (pp. 7–12) (Wash. Expt. Sta.); Orchard Practices in Controlling Codling Moth, by L. J. Richardson (pp. 31, 32); Cryolite in Codling Moth Control and a New Procedure for Its Application, by J. Marshall, K. Groves, and H. Fallscheer (pp. 123–130) and The Influence of Physical Characteristics of Arsenical Deposits on Codling Moth Control, by J. Marshall, S. Strew, and K. Groves (pp. 133–140) (both Wash.); and An Analysis of Successes and Failures in Codling Moth Control in 1938, by R. Sundquist (pp. 144–148).

The Entomological Branch (*Canada Min. Agr. Rpts., 1936–37, pp. 81–90; 1937–38, pp. 84–102*).—Further reports are made of the appearance of and control work with economic insects in Canada (E. S. R., 78, p. 512).

[Contributions on economic insects and related pests and their control] (*Jour. Southeast. Agr. Col., Wye, Kent, No. 44* (*1939*), *pp. 37, 38, 59–91, 103–108, 180–182, figs. 24*).—Contributions presented include The Control of Hop Red Spider—Some Recent Experiences (pp. 37, 38), A Note on Tyroglyphid Mites [*Cosmoglyphus* sp.] Occurring in Silage and on Lily of the Valley (pp. 59, 67), and Investigations on the Insect and Allied Pests of Cultivated Mushrooms—XIII, Another Tyroglyphid Mite [*Caloglyphus berlesei* Mich. 1903] (pp. 68–72) (E. S. R., 81, p. 69), all by S. G. Jary; Investigations on Insect Pests of Brassica Seed Crops in Romney Marsh, [I] (pp. 73–83) and II (p. 84), and Investigations on Wireworms, I (pp. 85–91), all by S. G. Jary and M. D. Austin; Hive Bees in Relation to Commercial Fruit Production, by C. H. Hooper (pp. 103–108); and

Notes on Diplopoda—VI, The Recognition of Some Millipedes of Economic Importance, III, by S. W. Rolfe (pp. 180–182) (E. S. R., 81, p. 69).

[Contributions on economic insects and insecticides] (*East Malling [Kent] Res. Sta. Ann. Rpt., 26 (1938), pp. 180–203, 250–252, 256–258, pls. 3, figs. 4*).—Contributions presented (E. S. R., 81, p. 69) relating to observations and work in Great Britain include Notes on Some Interesting Insects Observed in 1938, by A. M. Massee (pp. 180–185); The Control of Strawberry Aphis [*Capitophorus fragariae* Theob.] and Tarsonemid Mite, by R. M. Greenslade and A. M. Massee (pp. 186–190); The Bramble Shoot-Webber *Notocelia uddmanniana* L., by G. H. L. Dicker (pp. 191–198); Spray Residue Investigations—III, The Influence of Petroleum Oil and of Lime-Sulphur on the Retention of Lead Arsenate on Apples, by H. Shaw and W. Steer (pp. 199–203); Suggestions for Control of Strawberry Aphis [*Capitophorus fragariae* Theob.] by R. M. Greenslade and A. M. Massee (pp. 250–252); and Investigations With Insecticides, by W. Steer (pp. 256–258).

Insect and other pests of 1938, A. E. CAMERON (*Highland and Agr. Soc. Scot. Trans., 5. ser., 51 (1939), pp. 136–174, figs. 16*).—A discussion of the more important insect and tick pests of Scotland (E. S. R., 81, p. 69).

[Contributions on economic insects] (*Bul. Soc. Fouad I. Ent., 22 (1938), pp. 1–9, 36–59, 67–109, 233–283, 286–345, 357–395, pls. 10, figs. 95*).—Among the contributions presented are the following: Insects Injurious to Vegetables and Shrubs in the Jordan Valley, Huleh Area, and the Upper Galilee, by A. Grunberg (pp. 1–9); Description of a New Species of *Leptomastix* Parasitic in *Phenacoccus hirsutus* Green, by H. Compere (pp. 36–38) (Calif. Citrus Expt. Sta.); Studies on the Mediterranean Fruit-Fly (*Ceratitis capitata* Wied.)—I, The Structure and Operation of the Reproductive Organs, by A. D. Hanna (pp. 39–59); The Terminalia of the Genus *Wohlfahrtia* B. & B. and Those of Some Allied Genera, Together With Notes on the Natural Grouping of the Species of the Subfamilies Sarcophaginae and Miltogrammatinae, by W. S. Patton (pp. 67–109); Constant Temperature Hot Air Sterilizer for the Control of *Ephestia* and *Myelois* on Dates, by M. Shafik (pp. 233–263); A Mud Brick Oven for Drying Dates and Controlling *Ephestia*, by M. Shafik and A. L. Hilmy (pp. 265–277); A Brief Note on the Relation Between the Physiological Condition of Plants and Insect Attack, by H. Priesner (pp. 279–283); Notes on the Embryonic and Post-Embryonic Development of *Calandra oryzae* (Linn.) and Related Coleoptera, by K. Mansour (pp. 286–299); Efficiency of Commercial Sodium Cyanide and Sulphuric Acid in Liberating Hydrocyanic Acid Gas for the Fumigation of Citrus Trees in Egypt Against Scale Insects, by M. Shafik, A. Amer, and A. L. Hilmy (pp. 301–345); and The Ideal Spray Emulsion for the Control of Scale Insects on Citrus in Egypt, by M. Shafik and M. Husni (pp. 357–395).

[Contributions on economic zoology and entomology] (*Indian Sci. Cong. Proc. [Hyderabad], 24 (1937), pp. 300, 301, 303, 304, 307, 308, 309, 368–372*).—Included among the abstracts of contributions presented at the twenty-fourth Indian Science Congress held at Hyderabad in January 1937 are the following: The Anatomy of *Glyphidrilus annandalei* Mich., by K. Bhaskaran Nair (p. 300); Economic Aspect of Insect Parasitism, by T. V. R. Ayyar (pp. 300, 301); Biological Control in the Lac Industry, by P. M. Glover (p. 301); The Alimentary Canal of *Epilachna indica* (Coccinellidae: Coleoptera), With a Discussion on the Activities of the Mid-Gut Epithelium, by S. Pradhan (p. 303); Experiments on the Sterility of *Ephestia kuehniella* Z. in Relation to High Temperature (30° C.), by D. P. Raichoudhury and S. E. Jacobs (p. 304); Soil Moisture and Incubation Period in *Schistocerca gregaria* Forsk. Eggs, by M. A. Husain and T. Ahmad (p. 307); Cestode Parasites of Sheep and Goats in the Punjab, by M. Amin (p. 308); Some Coccinellids of the Punjab, by A. P. Kapur (p. 309); Cotton Jassids

and Hairiness of Cotton Plant, by M. A. Husain and K. B. Lal (p. 368): The Bird Enemies of the Cotton Leaf Roller *Sylepta derogata* Fb. at Khanewal (Multan, Punjab), by M. A. Husain and H. Bhalla (p. 368); Observations on the Life-History of Pink Bollworm *Platyedra gossypiella* Saund. at Parbhani (Deccan), by H. D. Nangpal, N. T. Nadkerny, and T. E. Krishnaswamy (p. 368); The Tur-Pod Fly *Agromyza obtusa* Mall., by T. Ahmad (pp. 368, 369); A New Cecidomyid Pest *Dasyneura lini* Barnes of Linseed in India, by H. S. Pruthi and H. L. Bhatia (p. 369); Life-History and Biology of the Weevil Borer *L[ixus] truncatulus* of Amaranthus, by T. Ahmad (pp. 369, 370); Studies on *Stenobracon nicevillei*, a Parasite of the Sugarcane White Moth Borer *Scirpophaga*, by M. C. Cherian and P. Israel (p. 370); A New Enemy of the Indian Honey Bee, by M. C. Cherian and V. Mahadevan (p. 370); Notes on the Life-History and Habits of *Dacus brevistylus* (Family Trypetidae), a Pest of *Coccinia indica* Fruits, by M. C. Cherian and C. V. Sundaram (p. 370); Studies on the Incidence of the Swarming Caterpillar [*Spodoptera mauritia* Boisd.] of Paddy, by M. C. Cherian and K. P. Anantanarayanan (p. 371); The Important Insect Problems Affecting the Cultivation of Cocoanuts in Cochin State and *Oxya velox* F. as a Pest of "Kole Paddy" in Cochin, both by C. S. Venkatasubban (p. 371); and Marriage Flight and Colony Founding of *Camponotus* (Tanae-Myrmex) *compressus* Latr., by P. N. Krishna Iyer (pp. 371, 372).

[**Contributions on economic zoology and entomology**] (*Indian Sci. Cong. Proc. [Calcutta], 25 (1938), pts. 3, pp. 158, 159, 162, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182–192, 274; 4, pp. 78–81*).—Among the contributions presented at the twenty-fifth Indian Science Congress held at Calcutta in January 1938 are the following: The Incidence of Cestode Parasites Among Ovine Hosts in the Punjab (p. 158), Two New Species of *Avitellina* (Cestoda) From Ovines in the Punjab (pp. 158, 159), and The Occurrence of the Cestode *Helictometra giardi* (Moniez 1879) in Indian Sheep (p. 159), all by M. Amin; On a New Nematode *Pseudaspidodera jnanendrae* n. sp. From Peafowl (*Pavo cristatus*), by G. K. Chakravarty (p. 159); Diseases Transmitted by Indian Species of Ticks in India and Other Countries and the Possibility of Their Prevention Through Biological Control, by M. Sharif (p. 162); Some Reversal Changes Among Locusts and Other Acridiidae and the Probable Importance of the Third Instar, by M. L. Roonwal (pp. 173, 174); A Preliminary Note on the Probable Existence of Seasonal Migration Among the Solitary Phase Individuals of *Locusta migratoria* in North-West India, by Y. R. Rao and D. R. Bhatia (p. 174); On Two Chalcidoid Parasites on Moths [*Brachymeria euploeae* (Westw.)], With a Description of *Eupelmus terminaliae* sp. nov., by H. A. Hafiz (p. 175); Some Species of the Scolytidae (Coleoptera) From Mysore, With Special References to the Occurrence of *Stephanoderes hampei* Ferr in Dry Cotton Fruit Stalks and Carpels, by T. V. Subramanian (pp. 175, 176); An Extra Hopper Stage in the Desert Locust *Schistocerca gregaria* Forsk., by C. B. Mathur (p. 177); On the Thoracic Mechanism of the Pulse Beetle *Bruchus quadrimaculatus* Fabr., by D. Mukerji (p. 177); Effect of Different Sugars on the Longevity of *Microbracon greeni* Ashm., by S. N. Gupta (p. 178); Further Observations on the Rôle of Blood in Ovulation in Culicidae, by S. K. Sen (pp. 178, 179); Length of Life of Pink Bollworm Moth and Its Correlation With Temperature and Humidity, by H. D. Nangpal and V. N. Poorna Pregna (p. 179); The Influence of Temperature on the Rate of Growth and Size in the Desert Locust *Schistocerca gregaria* Forsk., by Abdul Haq (p. 180); Life-History and Biology of *Monophlebus stebbingi*, by A. B. Misra and S. R. M. Rao (pp. 181, 182); On the Habits and Life-History of *Amphipsyche indica* Martynov. (Trichoptera), by H. A. Hafiz (p. 182); Two Caterpillars of Economic Im-

portance Not Recorded Before in S. India and The Economic Rôle of South Indian Horn Worms (Sphingidae), both by T. V. R. Ayyar (p. 182); The High Fecundity of the Epilachna Beetles *Epilachna vigintio[cto]punctata* Fabr. and *Epilachna dodecastigma* Mul. in Cochin, by C. S. Venketasubban and Neelakanta Iyer (pp. 182, 183); The Cotton Jassid *Empoasca devastans* Distant, by M. A. Husain and K. B. Lal (p. 183); Studies and Observations on the Incidence and Control of *Spodoptera mauritia* (Boisd.), a Major Pest of Rice in Cochin, by C. S. Venketasubban (p. 183); Observations on the Sugarcane Borer Incidence at the Government Sugarcane Farm, Jorhat, by K. C. Sharma (pp. 183, 184); *Semiothisa (Macaria) pervolgata*, a Geometrid Pest of Daincha (*Sesbania aculeata*), by M. C. Cherian and B. Rangiah Pillae (p. 184); Studies on *Laphygma exigua* Hb. and its Natural Enemies, by M. C. Cherian and M. S. Kylasam (p. 184); Effect of Bollworm Attack on the Number of Seed, Lint Weight, Seed Weight, and Ginning Percentage of Clean Locks in Partially Damaged Bolls, by H. D. Nangpal (pp. 184, 185); Incidence of Spotted Bollworm Attack on Cotton at Parbhani (Hyderabad-Dn), by H. D. Nangpal, N. T. Nadkarni, and T. E. Krishnaswami (p. 185); A Caterpillar Pest of Champaka (*Michelia*) in South Malabar District, by T. V. R. Ayyar (p. 185); A New Cecidomyiad Pest of *Moringa*, by M. C. Cherian and M. Basheer (p. 185); The Amaranthus Stem Weevil of S. India (*Lixus brachyrrhinus* Boh.) and Its Parasites, by P. N. K. Ayyar (pp. 185, 186); Measures Against Sugarcane Pests in the Jullundur Circle, by M. Fateh-ud-din and B. D. Singh (p. 186); An Annotated Conspectus of the Insects Affecting Fruit Crops in South India, by T. V. R. Ayyar (p. 186); Some Observations on the Bionomics and Control of Fruit Fly Pests in the N.-W. Frontier Province, by H. S. Pruthi and H. L. Bhatia (p. 187); On *Agrilus citri* Thery (Buprestidae), a Pest of *Citrus acida* in Bihar, by B. B. Bose (p. 187); Studies on the Coconut Beetle *Oryctes rhinoceros* Linn. in South India, by M. C. Cherian and K. P. Anantanarayanan (p. 187); Preliminary Studies on the Biology of the Mite (*Tetranychus* sp.), by A. N. Sapra (pp. 187, 188); Mass Breeding of *Microbracon greeni* Ashm.—an Ectoparasite of the Larva of *Eublemma amabilis* Moore Predaceous on Lac, by S. N. Gupta (p. 188); A Preliminary Note on the Bionomics and Mass Breeding of *Trichogramma* sp., by A. G. Hussain (pp. 188, 189); A Trachogrammid Chalcid Parasite of the Egg of *Eublemma amabilis* Moore Predaceous on Lac, by J. N. Singh, P. S. Negi, M. P. Misra, and S. N. Gupta (p. 189); *Apanteles tachardiae* Cam. and Endoparasite of the Larva of *Holcocera pulverea* Meyr. Predaceous on Lac, by M. P. Misra, S. N. Gupta, and J. N. Singh (p. 189); *Pareuderus torymoides* Ferr, an Egg Parasite of the Amaranthus Borer *Lixus truncatulus* (pp. 189, 190) and A Chalcid Parasite of the Linseed Midge *Dasyneura lini* (p. 190), both by T. Ahmad; Notes on a Braconid Parasite of the Wax Moth (*Galleria mellonella*), by M. C. Cherian and S. Ramachandran (p. 190); *Rhaconotus scirpophaga*, a Parasite of the Sugarcane White Moth Borer (*Scirpophaga*), by M. C. Cherian and M. Israel (pp. 190, 191); The Bacterial Flora in the Gut of the Larvae of the Cocoa Moth *Ephestia elutella* Hb., by S. E. Jacobs and D. P. Raichoudhury (p. 191); The Cotton White-Fly As a Vector of the Leaf Curl Disease of Tobacco, by H. S. Pruthi (p. 191); The Relative Efficiency of Some Methods for Comparing Jassid Population in Cotton Fields, by K. B. Lal (pp. 191, 192); Observations on the Bionomics of the Ox Warble-Fly *Hypoderma lineatum*, by B. N. Soni (p. 274); and biological control of insect pests (pp. 78–81).

[Work with economic insects in 1937] (*Philippine Bur. Plant Indus. Ann. Rpt., 1937, pp. 76–78*).—Report is made of laboratory studies and field control work with economic insects, particularly grasshoppers.

Meadow and pasture insects, H. OSBORN (*Columbus, Ohio: Educators' Press, [1939], pp. VIII+288, figs. 103*).—This work, with a foreword by L. O. Howard, is presented in 13 chapters and an appended list of 296 references to the literature. Preceding the chapters presenting the subject under the more important orders of insects found in meadow and pasture are others on the ecology of the meadow (pp. 12–42), animal groups in the meadow fauna (pp. 43–55), the insect population (pp. 56–59), and general control measures for meadow and pasture insects (pp. 60–69).

The dodder and its insects, W. D. PIERCE (*Bul. South. Calif. Acad. Sci., 38 (1939), No. 1, pp. 43–53, fig. 1*).—A report is made of insects, particularly weevils, taken in or reared from the flowers of *Cuscuta californica* on the El Segundo, Calif., sand dunes. Three species of the genus *Smicronyx* and one of the genus *Berginus* are described as new.

[**Contributions on sugarcane insects and rodents and their control**] (*Internatl. Soc. Sugar Cane Technol. Cong. [Baton Rouge, La.] Proc., 6 (1938), pp. 89–112, 223–261, 361–386, 421–426, 461–467, 472–513, 581–616, 693–709, figs. 17*).—Entomological contributions presented at the Sixth Congress of the International Society of Sugar Cane Technologists are: Sugarcane Pests in Florida, by J. W. Ingram, H. A. Jaynes, and R. N. Lobdell (pp. 89–98) (U. S. D. A. and Fla. Expt. Sta.); Rodents in Relation to Sugarcane Growing, by F. E. Garlough (pp. 98–105) (U. S. D. A.); The Field Rats and Their Control in Formosa, by S. Takano and T. Kondo (pp. 106–112); Biological Control of *Diatraea saccharalis* (Fabricius) in St. Lucia, B. W. I., by H. E. Box (pp. 223–240); Some Aspects of the Control of the Sugarcane Moth Borer *Diatraea saccharalis* F., by R. W. E. Tucker (pp. 240–243); The Introduction and Colonization of the Amazon Fly *Metagonistylum minense* Tns. in Puerto Rico, by K. A. Bartlett (pp. 243–245), Further Attempts to Establish *Lixophaga diatraea* (Towns.) and Other Sugarcane Borer Parasites in Louisiana and Florida, With Recoveries in 1936 and 1937, by H. A. Jaynes (pp. 245–258), and Introduction and Recoveries of Parasites of Sugarcane Insects in Continental United States, by T. E. Holloway (pp. 258–261) (all U. S. D. A.); Trend in Natural Parasitism of Sugarcane Borer (*Diatraea saccharalis* (F.)) by *Trichogramma* spp., by A. L. Dugas (pp. 361–367) (La. Sta.); *Trichogramma* Proves Itself in Sugarcane Borer Control, by E. G. Smyth (pp. 367–377); The Progress of Applied Entomology in Mauritius During the Years 1933 to 1938, With Reference to Insects of the Sugarcane, by W. F. Jepson and L. A. Moutia (pp. 377–382); The Introduction of Predatory Beetles Into Puerto Rico to Aid in the Control of the Yellow Cane Aphid *Sipha flava*, by K. A. Bartlett (pp. 383–385) (U. S. D. A.); An Attempt to Colonize *Hippodamia convergens*, by C. O. Eddy (pp. 385, 386) (La. Sta.); Some Phases of Biological Control Work Applicable to Sugarcane Insect Problems, by C. P. Clausen (pp. 421–426) (U. S. D. A.); Stem Galls of Sugarcane Induced With An Insect Extract, by J. P. Martin (pp. 461–467) (Hawaii. Sugar Planters' Sta.); Biology and Importance of the Sugarcane Rootstock Weevil *Anacentrinus subnudus* Buch. in Louisiana, by B. A. Osterberger and M. B. Christian (pp. 472–475) (La. Sta.); The Cell-Sap Concentration of Sugarcane Varieties in Relation to Their Resistance to the Attack of the White Leaf Louse, by M. Yamasaki and H. Arikado (pp. 475–478); A Summary of Investigations on the Sugarcane Beetle in Louisiana, by J. W. Ingram, E. K. Bynum, and W. A. Douglas (pp. 478–482), and Insect Vectors of Sugarcane Mosaic in Continental United States, by J. W. Ingram, W. E. Haley, and L. J. Charpentier (pp. 483–494) (both U. S. D. A.); Some Aspects of the Campaign Against the Moth Borer *Diatraea saccharalis* Fabr. in Antigua and St. Kitts, 1931–1938, by H. E. Box (pp. 495–513); Preliminary Report on Studies of Progenies of Sugarcane Crosses

for Susceptibility to Sugarcane Borer Injury in Louisiana, by R. Mathes, J. W. Ingram, and W. E. Haley (pp. 581–589) (U. S. D. A.); The Introductions of *Theresia claripalpis* V. d. W. Into Cuba and Its Artificial Multiplication, by L. C. Scaramuzza (pp. 589–595); Quarantine Measures Against Insects Carried by Transpacific Airplanes, by C. E. Pemberton (pp. 595, 596) (Hawaii. Sugar Planters' Sta.); Sources of Infestation by the Sugarcane Borer and Trash Treatment for the Destruction of Overwintering Borers, by E. K. Bynum, W. E. Haley, and L. J. Charpentier (pp. 597–610), and Plant Quarantine Restrictions on the Entry of Sugarcane Into the United States, by E. R. Sasscer (pp. 611–616) (both U. S. D. A.); Experiments With Insecticides in the Control of the Sugarcane Borer (*Diatraea saccharalis* (Fab.)), by L. O. Ellisor and J. W. Ingram (pp. 693–705) (La. Sta. and U. S. D. A.); and Sugar and Sugar Products in Insecticides, by C. O. Eddy (pp. 705–708) (La. Sta.).

[**Contributions on fruit insects and their control**] (*Ind. Hort. Soc. Trans., 1938, pp. 33–40, 67–71, 85–103, 104–107, 114–116, 129–143*).—Contributions presented at the seventy-eighth annual meeting held at La Fayette in January 1939 include the following: Oriental Fruit Worm Control With Parasites, by J. J. Davis (pp. 33–35), and The Control of the Oriental Fruit Moth by Mechanical Means, by G. E. Marshall (pp. 37–40) (both Ind. Expt. Sta.); Sprays for Aphid Control, by G. S. L. Carpenter (pp. 67–70); The Effect of Recent Increase in Government Lead Tolerance on Spray Practice, by C. L. Burkholder (p. 85) (Ind. Sta.); Codling Moth Insecticide Investigations in 1938 at the Vincennes Laboratory, by L. F. Steiner, J. E. Fahey, and S. A. Summerland (pp. 86–99) (U. S. D. A.); Recent Studies and Trends in Codling Moth Control in Indiana, by G. E. Marshall (pp. 100–102) (Ind. Sta.); and Our Experience With Nicotine-Bentonite Spray, by S. W. Holmes (pp. 104–106).

Other contributions given are: Removal of Nicotine-Bentonite Spray Residues from Apples at Harvest, by J. E. Fahey, H. W. Rusk, L. F. Steiner, and R. F. Sazama (pp. 114–116) (U. S. D. A.); and The Present Status of the Oriental Fruit Moth in Indiana, by G. E. Marshall (pp. 129–132), The Theory and Practice of First Brood Codling Moth Control, by C. L. Burkholder (pp. 132–134), Mr. Fruit Grower Versus Codling Moth, by J. J. Davis (pp. 134–139), and Lead and Arsenic Residues Resulting From Several Spray Schedules and Materials, La Fayette, 1937, by C. L. Burkholder, O. W. Ford, and D. L. Johnson (pp. 139–143) (all Ind. Sta.).

The insect problem in shelterbelt plantations, J. A. Munro (*North Dakota Sta. Bimo. Bul., 1 (1939), No. 6, pp. 3, 4*).—Brief mention is made of borers and leaf-eating insects, the two groups of chief importance as enemies of the shelterbelt plantings of the Northern Great Plains area. The species concerned are the carpenter worm, particularly destructive in the older plantings of green ash and to a lesser extent the American elm and cottonwood, the ash borer, which sometimes causes appreciable injury to shelterbelt plantings of ash and lilac, the flatheaded apple tree borer, which with other borers attack upwards of 90 percent of newly transplanted stock, cankerworms, grasshoppers, and a hornworm (*Hyloicus chersis*).

202 common household pests of North America, H. Hartnack (*Chicago: Hartnack Pub. Co., 1939, pp. 319, [figs. 268]*).—A practical account.

House insulation and insect infestations, E. A. Back. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 41 (1939), No. 4, pp. 129–136, figs. 10*).

Medical entomology, W. B. Herms (*New York: Macmillan Co., 1939, 3. ed., rev., pp. XIX+582, figs. [197]*).—This, the third edition of the work previously noted (E. S. R., 51, p. 356), appears under an abbreviated title, and is a completely rewritten edition.

A list of parasites recorded from the domestic and wild animals and birds of Cyprus, R. MOYLAN GAMBLES (*Cyprus Agr. Jour., 34 (1939), No. 1, pp. 29–32*).

A study of the olfactory responses of insect parasites to the food plant of their host, W. H. THORPE and H. B. CAUDLE (*Parasitology, 30 (1938), No. 4, pp. 523–528*).

The chemical control of insect pests of animals, J. HENDRICK and W. MOORE (*Highland and Agr. Soc. Scot. Trans., 5. ser., 51 (1939), pp. 58–74*).

The control of fleas and tropical rat mites, M. A. STEWART. (Univ. Calif.). (*Pests, 7 (1939), No. 5, pp. 6, 7, 8*).

[Contributions on insect control] (*Tenn. State Hort. Soc. Proc., 33 (1937), pp. 73–78, 84–88*).—Contributions on insect control presented at the annual convention at Jackson in November 1937 include: Control of Tomato Fruit Worm by Use of Cottonseed Meal Containing 10 Percent Cryolite, by W. W. Stanley (pp. 73–77), Control of Tomato Fruit Worm, by W. W. Stanley and S. Marcovitch (pp. 77, 78), and Spray Residues and Human Health, by S. Marcovitch (pp. 84–88) (all Tenn. Expt. Sta.).

Entoma: A directory of insect pest control, edited by C. C. HAMILTON (*Plainfield, N. J.: Boise Ptg. Co., 1939, 3. ed., pp. [1]+170*).—A revised edition of this directory (E. S. R., 78, p. 657).

Fly spray analysis (*Soap, 14 (1938), No. 10, pp. 91, 93, 95*).—An account is given of a systematic study made by the Pacific Coast Insecticide Association of certain acid methods for determining pyrethrins I and II in household insecticides.

Insecticide analysis: The determination of pyrethrins in pyrethrum products and of rotenone in derris and cube, J. J. T. GRAHAM. (U. S. D. A.). (*Soap, 15 (1939), No. 2, pp. 97, 99, 101, 109*).

Pyrethrum evaluation, M. S. LOWMAN and W. N. SULLIVAN. (U. S. D. A.). (*Soap, 14 (1938), No. 11, pp. 89–91, 93, 119*).—A report on the relation of the pyrethrin content of pyrethrum flowers to their toxicity to mosquito larvae.

Preparation of pyrethrins: Isolation of pyrethrin II, M. S. SCHECHTER and H. L. HALLER. (U. S. D. A.). (*Soap, 14 (1938), No. 11, pp. 101, 103*).—A report on the effect of aqueous extraction on the pyrethrin content of pyrethrum.

Methyl bromide used successfully to fumigate plants in soil beds, C. C. HAMILTON. (N. J. Expt. Stas.). (*Hort. Topics, 3 (1939), No. [6], p. 11*).—Experiments have shown that methyl bromide emulsions made by adding 50 cc. of methyl bromide to 250 cc. of wood alcohol and adding this to 3 gal. of water will kill grubs of the Asiatic beetle in azalea beds both in the greenhouse and outdoors. Examination made 7 days after treatment revealed that 100 percent of the Asiatic beetle larvae were either dead or completely disabled, the azalea plants having suffered no injury. The 3 gal. of emulsion thus prepared was applied with a sprinkling can to 50 sq. ft. of soil containing growing azalea plants.

The use of protective films of insecticide in the control of indoor insects, with special reference to Plodia interpunctella Hb. and Ephestia elutella Hb., C. POTTER (*Ann. Appl. Biol., 25 (1938), No. 4, pp. 836–854*).—In a series of experiments and a field scale trial made of a film spraying method for the protection of stored goods from infestation by the tobacco moth and *P. interpunctella* reinfestation was prevented completely when the goods were efficiently sterilized before storage. "The procedure is to spray the interior of the warehouse and the cases stored in it with an insecticide consisting of a solution of 0.8 percent pyrethrins in a white oil, the constitution of which is given. The apparatus and method of spraying are described. Spraying should be started

some time before the moths are expected to emerge, in England about May 15, and should be continued twice a week throughout the period of moth emergence, which may continue until September 30."

Effect of arsenic and copper sprays on Navel oranges, R. H. MARLOTH and F. J. STOFBERG (*Farming in So. Africa, 14 (1939), No. 158, pp. 180, 181*).—This report deals with the results obtained over a 4-yr. period as to the effect of the application of lead arsenate and copper carbonate sprays on the quality of Washington Navel orange fruits, as determined by the total soluble solids and acid contents of the juice. "No evidence was obtained of any effect of lead arsenate on the total soluble solids in the fruit juice. Copper carbonate applied in five cover sprays at the total rate of 5 oz. per large tree showed no effect on either the total soluble solids or acid contents of the juice of fruit from sprayed trees. A slight earliness in coloring of the fruit sprayed with this material was observed. Chemical analyses made showed that the quantity of arsenic present in the fruit juice following cover sprayings with lead arsenate was negligible. No increase in the lead or copper content in the fruit juice above that normally found resulted from cover sprays of lead arsenate and copper carbonate."

It is pointed out that the insect pests of citrus in South Africa include the false codling moth *Argyroploce leucotreta*, the Mediterranean fruitfly, the Natal fruitfly *Pterandrus rosa*, and the bollworm.

Winter spraying: Trees and shrubs, C. C. HAMILTON. (N. J. Expt. Stas.). (*Shade Tree, 12 (1939), No. 2, pp. [2–5]*).

An investigation of the interrelationships of the vegetation, soils, and termites, J. M. MURRAY (*So. African Jour. Sci., 35 (1938), pp. 288–297, figs. 2*).

***Notes on Symphyla with descriptions of three new species of Symphylella* from California,** A. E. MICHELBACHER. (Univ. Calif.). (*Pan-Pacific Ent., 15 (1939), No. 1, pp. 21–28, fig. 1*).—Under the names *S. subterranea*, *S. essigi*, and *S. capitata*, three members of the genus *Symphylella*, occurring in California, are described as new to science.

Psocids in dwellings, E. A. BACK. (U. S. D. A.). (*Pests, 7 (1939), No. 6, pp. 8, 9*).

Grasshopper outbreaks in Missouri, G. D. JONES (*Missouri Sta. Bul. 406 (1939), pp. 32, figs. 12*).—A review is given of the occurrences of grasshoppers in the Missouri area as known since 1817, together with 22 references to the literature consulted. Notes on the life history of the native grasshoppers of Missouri and observations made during recent outbreaks are briefly considered.

Vegetation types associated with plague "grasshoppers" in South Australia, H. G. ANDREWARTHA, J. DAVIDSON, and D. C. SWAN (*So. Austral. Dept. Agr. Bul. 333 (1938), pp. 47, pl. 1, figs. 73*).

Field observations on the brown locust in an outbreak centre, C. J. B. SMIT (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 190 (1939), pp. 143, figs. 34*).—A detailed report of observations during the seasons 1935–36, 1936–37, and 1937–38 on the *solitaria* and *transiens congregans* phases of the brown locust *Locustana pardalina* (Walk.) in its natural environment. A list is given of 19 references to the literature.

The locust outbreak in Africa and western Asia in 1937, B. P. UVAROV and W. MILNTHORPE (*London: Econ. Advisory Council, Com. Locust Control, 1939, pp. 64, pls. 9*).—A further report on locust outbreaks (E. S. R., 80, p. 228).

The occurrence of the brown and red locust [Locustana pardalina and Nomadacris septemfasciata] in the Union during the seasons 1934–35 and 1935–36, C. DU PLESSIS (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 164 (1937), pp. 17, figs. 9*).

Control of mole crickets, J. R. WATSON. (Fla. Expt. Sta.). (*Citrus Indus., 20 (1939), No. 5, p. 14*).

Notes on the bionomics of roaches inhabiting houses, G. E. GOULD and H. O. DEAY. (Purdue Univ.). (*Ind. Acad. Sci. Proc., 53 (1937), pp. 281–284*).

A synopsis of the American species of Chirothrips Haliday (Thysanoptera), F. ANDRE. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 41 (1939), No. 6, pp. 192–204, figs. 10*).

Five new species of Miridae from Texas (Hemiptera), H. G. JOHNSTON. (Tex. A. and M. Col.). (*Bul. Brooklyn Ent. Soc., 34 (1939), No. 2, pp. 129–133*).—One species each of the genera *Atractotomus* and *Eustictus* and three species of the genus *Neoborus* are described as new to science.

The flugorina of Barro Colorado and other parts of Panama, Z. P. METCALF. (Univ. N. C.). (*Bul. Mus. Compar. Zool., 82 (1938), No. 5, pp. [1]+277–423, pls. 23*).

The injury and spread in France of Ceresa bubalus F., the American buffalo treehopper enemy of cultivated crops [trans. title], A. BALACHOWSKY (*Rev. Pathol. Vég. et Ent. Agr. France, 26 (1939), No. 1, pp. 39–61, figs. 8*).—This membracid, which was first reported from Europe by Horwarth in 1931, having been discovered in Hungary, has since spread and is now of economic importance in southern France. A bibliography of 20 references is given.

The behavior of POJ 2878 sugar cane in relation to Fiji disease and transmission of the virus by nymphs of Perkinsiella vastatrix, G. O. OCFEMIA and M. S. CELINO (*Phytopathology, 29 (1939), No. 6, pp. 512–517, fig. 1*).—In transmission experiments it was found that in addition to adults of the leafhopper *P. vastatrix*, second, third, fourth, and fifth instar nymphs can transmit the virus of Fiji mosaic disease of sugarcane. It is pointed out that the nymphs that hatch from eggs laid by viruliferous leafhoppers do not carry the Fiji disease virus. The viruliferous adult *P. vastatrix* requires at least 24 hr. to elapse before it can transmit the disease.

Dormant and delayed dormant sprays for the control of the rosy apple aphids in Virginia, W. S. HOUGH. (Va. Expt. Sta.). (*Pa. State Hort. Assoc. Proc., 80 (1939), pp. 21–24*).

Studies on aphides infesting the potato crop.—VII, Report on a survey of the aphis population of potatoes in selected districts of Scotland (July 25–August 6, 1936), W. M. DAVIES (*Ann. Appl. Biol., 26 (1939), No. 1, pp. 116–134, fig. 1*).—In this further contribution (E. S. R., 80, p. 73) the results of a survey of the green peach aphid, *Macrosiphum gei* Koch, *Aphis rhamni* Boyer, and *Myzus pseudosolani* Theob. on potatoes in certain districts of Scotland are reported.

Transmission of sugarcane mosaic by aphids, H. D. TATE and S. R. VANDENBERG. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 1, pp. 73–79*).—In sugarcane mosaic transmission experiments in Puerto Rico, four species of aphids were used, namely, *Carolinaia cyperi* Ainsl., the rusty plum aphid, *Sipha flava* (Forbes), and the corn leaf aphid. It was shown that *C. cyperi* can transmit mosaic from diseased to healthy sugarcane plants. Of 192 plants exposed to *C. cyperi* taken from diseased plants, 31.2 percent developed mosaic, as did 34.5 percent of 200 healthy plants exposed to infective corn leaf aphids. Field observations revealed the presence of *C. cyperi* on its host plant (*Cyperus rotundus*) in and around sugarcane fields in Puerto Rico in considerable abundance in certain periods of the year. In the transmission experiments the rusty plum aphid was shown to transmit mosaic from diseased to healthy sugarcane plants, thus confirming the evidence obtained by earlier investigators. Of 75 healthy sugarcane plants exposed to *S. flava* taken from diseased plants, none

developed mosaic. In most cases a considerably higher percentage of transmission resulted when young seedling plants were exposed to infective aphids than when plants grown from cuttings were employed.

Time of pea aphid treatment in relation to aphid populations and plant development in Wisconsin, H. F. WILSON and C. E. DIETER (*Canner, 88 (1939), No. 23, pp. 18, 19, figs. 6*).

Three new species of Aphididae (Homoptera), A. A. GRANOVSKY. (Minn. Expt. Sta.). (*Ent. Soc. Wash. Proc., 41 (1939), No. 5, pp. 143–154, figs. 17*).—*Drepanosiphum oregonensis*, which feeds singly on the lower side of maple (*Acer macrophyllum*) leaves in Oregon; *Calaphis coloradensis*, common on western red birch (*Betula fontinalis*) and taken on *B. alba*, feeding on the lower side of the leaves and terminal shoots of young growth in Colorado and Utah; and *Myzocallis meridionalis*, which feeds on the lower side of leaves of several oaks, namely, water oak (*Quercus nigra*), white oak (*Q. alba*), red oak (*Q. rubra*), and willow oak (*Q. phellos*), in Texas, Georgia, and Mississippi, are described as new.

Entomological investigations on the leaf-curl disease of tobacco in Northern India.—III, The transmission of leaf-curl by white-fly Bemisia gossypiperda to tobacco, sann-hemp, and a new alternate host of the leaf-curl virus, H. S. PRUTHI and C. K. SAMUEL (*Indian Jour. Agr. Sci., 9 (1939), No. 2, pp. 223–275, pls. 4, fig. 1*).

Spot treatment for red scale, M. B. PATTERSON (*Calif. Citrog., 24 (1939), No. 10, pp. 368, 369, fig. 1*).—A description is given of the so-called spot treatment for red scale, which has proved economical and effective in the Corona district of California in handling resistant red scale where spotty conditions of infestation frequently are found.

Results of different methods of oil application for the control of scale insects on citrus, W. L. THOMPSON. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc., 51 (1938), pp. 109–114*).

The opportunity for forestry practice in the control of gypsy moth in Massachusetts woodlands, C. E. BEHRE (*Jour. Forestry, 37 (1939), No. 7, pp. 546–551, figs. 2*).—The author concludes that, with the gypsy moth recognized as an established pest in New England, control efforts in Massachusetts woodlands should turn from measures aimed at eradication to the creation of forest conditions less favorable for serious outbreaks.

Some observations on the life history, habits, and control of the rice caseworm Nymphula depunctalis Guen., P. SISON (*Philippine Jour. Agr., 9 (1938), No. 3, pp. 273–301, pls. 4, fig. 1*).—A report of studies of *N. depunctalis*, one of the most important rice pests in the Philippines, where it attacks the crop from July to November. Its life cycle from egg to egg, under laboratory conditions, varied from 21 to 37 days, with an average of about 27 days. A list is given of 14 references to the literature.

The cactus-feeding Phycitinae: A contribution toward a revision of the American pyralidoid moths of the family Phycitidae, C. HEINRICH (*U. S. Natl. Mus. Proc., 86 (1939), No. 3053, pp. 331–413, pls. 29*).—In this contribution on the cactus-feeding group of American pyralidoid moths 18 genera, 46 species, and 2 varieties are considered, of which 8 genera and 8 species are described as new to science.

The habitat, distribution, and dispersal of the psychid moth Luffia ferchaultella in England and Wales, R. S. McDONOGH (*Jour. Anim. Ecol., 8 (1939), No. 1, pp. 10–28, figs. 3*).—Report is made of a study of *L. ferchaultella*, a small wingless moth with casebearing larvae that depend for food on the

algal-lichen flora of the trunks of trees. The larvae are carried by the wind to a distance of at least several miles.

Further notes on the fall cankerworm and its control by "solid-stream" spraying, R. E. BALCH (*Sci. Agr., 19 (1939), No. 7, pp. 411-423, figs. 4*).—These notes relate to further investigations, particularly of the outbreak of the fall cankerworm on the large elms in Fredericton, New Brunswick (E. S. R., 80, p. 367), which has been completely controlled by spraying, although it continues in the woodlands of the St. John Valley. Additional notes are given on the bionomics of the species, and the methods of control by spraying are described.

It appears that the fall cankerworm may be a very serious pest of elm trees in a town if the trees are numerous and the ground beneath them is not more than 60-percent paved. "Complete control by spraying is possible on trees up to 100 ft. in height with a solid-stream sprayer which has a capacity of 400-lb. pressure and 50 U. S. gal. per minute. Calm weather is necessary, however. Pyrethrum powder, 0.8 percent pyrethrins, at the rate of 2 lb. per 100 Imperial gal. will give extremely satisfactory control if applied before the larvae reach the final stage. The addition of 5 lb. of arsenate of lead will insure practically 100-percent control if the spraying is thorough. This may be dispensed with, however, in moderate infestations. A sticker is not essential. Spraying is much cheaper and more efficient than banding."

The citrus rind borer and its control, C. E. GARCIA (*Philippine Jour. Agr., 10 (1939), No. 1, pp. 89-93, pls. 2*).—A brief account of *Prays citri* Milliere, one of the most serious pests of the pummelo, sweet orange, lemon, lime, and several other varieties, including the wild citrus, and its control. It is one of the most serious pests of these fruits in the Philippines, India, Ceylon, and Malay.

Cryolite recommended for control of orange tortrix, A. M. BOYCE and C. O. PERSING. (Calif. Citrus. Expt. Sta.). (*Citrus Leaves, 19 (1939), No. 5, pp. 5, 26*).—The work of a representative committee is said to have shown that a dust mixture of cryolite applied at the rate of 0.5 lb. per mature tree can be safely used against the orange tortrix without exceeding the fluorine tolerance. "Without consideration of other insect problems, the most practical formula is cryolite 50 percent plus talc 50 percent. A dosage of 1 lb. of the dust mixture to the tree should be used. However, if sulfur dust is used in an insect control program, in which a treatment will be applied after about May 15, the cryolite may be incorporated with the sulfur dust. A generally useful formula is cryolite 40 percent plus sulfur 60 percent, used at a dosage of 1.25 lb. to the tree. This allows 0.5 lb. of cryolite and 0.75 lb. of sulfur per tree. If the treatment is applied at a time when more than 0.75 lb. of sulfur per tree is desirable, either the dosage per tree of the above formula should be increased or an appropriate formula used. However, regardless of the percentage of cryolite in the dust mixture, a dosage that would allow 0.5 lb. of cryolite per tree should be used. Only a well-established brand of cryolite should be considered."

Present recommendations for control of orange tortrix, A. M. BOYCE and C. O. PERSING. (*Calif. Citrus Expt. Sta.*). (*Calif. Citrog., 24 (1939), No. 8, pp. 278, 312*).—A discussion of recommended control measures for the orange tortrix.

A field experiment on the control of the European corn borer (Pyrausta nubilalis Hubn.) by Beauveria bassiana Vuill.—II, G. BEALL, G. M. STIRRETT, and I. L. CONNERS (*Sci. Agr., 19 (1939), No. 8, pp. 531-534*).—Work conducted in 1937 in continuation of that of the preceding year (E. S. R., 78, p. 826) has again shown that the time of application of the fungus *B. bassiana* is of the greatest importance when used against the European corn borer and worthy of further investigation. In both 1936 and 1937 a control of 60 or 70 percent was effected.

The development of a second generation of the European corn borer (Pyrausta nubilalis Hbn.) in Indiana, G. A. FICHT. (Ind. Expt. Sta.). (*Ind. Acad. Sci. Proc., 54 (1938), pp. 211–215, fig. 1*).—Evidence is presented that a second generation of the European corn borer occurs in Indiana, although there has been little tendency on the part of such generation to select host plants other than corn for oviposition. The importance of the appearance of the second brood in Indiana is pointed out.

The use of baits in oriental fruit moth control, M. L. BOBB. (Va. Expt. Sta.). (*Md. State Hort. Soc. Proc., 41 (1939), pp. 15–20*).

Ethylene dichloride emulsion for the control of the peach borer, O. I. SNAPP. (U. S. D. A., Ill. and N. Y. State Expt. Stas. et al.). (*Tenn. State Hort. Soc. Proc., 34 (1938), pp. 82–86*).

Baits and bait traps in codling moth control, M. L. BOBB, A. M. WOODSIDE, and R. N. JEFFERSON (*Virginia Sta. Bul. 320 (1939), pp. 19, figs. 7*).—Studies conducted in Virginia over a period of 4 yr. in Albemarle and Augusta Counties during the season of 1935 to 1938, inclusive, and in Patrick County in 1938 are reported. A bait that consisted of 1 part of stock sirup to 20 parts of water to which 1 cc. of anethol per quart was added proved to be the most constantly attractive material tested during the 4-yr. period. "Generally the catch of moths was increased to a slight extent during the summer months by the addition of a small amount of sodium benzoate to the bait mixture. Few moths were caught in old, rusty traps. The largest catch of moths was made in new, unpainted bait traps, and the second largest in bait traps painted with aluminum paint. The position of the bait trap in the tree was an important factor in determining its efficiency. When three bait containers were suspended at three different heights in an apple tree, the trap in the top of the tree captured more moths than the other two traps combined. The use of ¼-inch-mesh wire screens over the tops of the traps had little effect on the catch of moths, but there was a slightly higher percentage of moths captured in traps without covers. Of the captured moths examined during 1938, approximately 60 percent were females and less than 5 percent of these had deposited their full quota of eggs. Bands on trees in unbaited blocks of apple trees caught approximately six times as many codling moth larvae as similar bands on trees in the baited block of trees in the same orchard. Under usual weather conditions, bait traps should be suspended in apple trees about May 1 in central Virginia and about April 20 in southern Virginia."

[Codling moth control work] (*Ind. Hort. Soc. Trans., 1937, pp. 84, 85, 88–107*).—Contributions presented at the annual meeting of the Indiana Horticultural Society at La Fayette, January 1938, on codling moth include: Some Results of Bait Trap Experiments in 1937, by L. F. Steiner and S. A. Summerland (pp. 84, 85), Per Cent Larvicidal Efficiency and Spray Deposits in Relation to Growth, Rainfall, and Timing of Cover Sprays on Jonathan, by L. F. Steiner, J. E. Fahey, R. F. Sazama, and H. W. Rusk (pp. 88, 89), and Large Scale Tests of Tank-Mix Nicotine-Bentonite-Soyoil in 1937, by L. F. Steiner and R. F. Sazama (pp. 89–91) (all U. S. D. A.).

Check list of the Lepidoptera of boreal America, superfamilies Sphingoidea, Saturnioidea, and Bombycoidea of the families Syntomidae and Arctiidae, W. BARNES and F. H. BENJAMIN (*Bul. South. Calif. Acad. Sci., 26 (1927), No. 2, pp. 35–59*).—A continuation of this check list (E. S. R., 56, p. 662).

The mosquitoes of the Southeastern States, W. V. KING, G. H. BRADLEY, and T. E. McNEEL (*U. S. Dept. Agr., Misc. Pub. 336 (1939), pp. 91, pls. 6, figs. 26*).—The introductory part of this work consists of an account of the genera and species found in the southeastern United States, summarized in table form; the literature on mosquitoes; their general characteristics and habits; collec-

tion and preservation of material; and identification. Methods of mosquito control are then dealt with (pp. 14–28), followed by notes on the genera, 11 in number, and the species (pp. 28–57), and synoptic tables for the identification of the mosquitoes of this area, both adults and fourth-stage larvae. A list of 122 references to the literature cited and an index of genera and species are included.

Habits of Aedes thibaulti Dyar and Knab. (Diptera, Culicidae), W. R. Horsfall. (Univ. Ark.). (*Jour. Kans. Ent. Soc., 12 (1939), No. 2, pp. 70, 71*).

Ground beetles predatory on the eggs of Aedes mosquitoes, H. H. Stage and W. W. Yates. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 41 (1939), No. 6, pp. 204–206*).

Notes on some parasites and predators of blackflies (Simuliidae, Diptera), C. R. Twinn (*Canad. Ent., 71 (1939), No. 5, pp. 101–105*).—These notes relate to certain of the natural enemies of blackflies, some of which may be of value in developing biological control measures.

Biology, morphology, and anatomy of aphidophagous syrphid larvae, M. L. Bhatia (*Parasitology, 31 (1939), No. 1, pp. 78–129, figs. 75*).—This contribution reports upon the biology, morphology, and anatomy of seven species of syrphid larvae found in Cambridge that live on aphids, namely, *Syrphus luniger* Meig., *S. balteatus* DeG., *S. ribesii* Linne, *Catabomba pyrastri* Linne, *Sphaerophoria flavicauda* Zett., *S. scripta* Linne, and *Platychirus scutatus* Meig. A list of 36 references to the literature is included.

On the changes in chemical composition associated with larval development in the sheep blowfly, R. C. Rainey (*Ann. Appl. Biol., 25 (1938), No. 4, pp. 822–835, figs. 5*).—The disappearance of fat typical of cleidoic eggs is the most marked change in composition found by the author during embryonic development of the sheep blowfly *Lucilia sericata*.

Studies of the physiology and toxicology of blowflies.—1, The development of a synthetic medium for aseptic cultivation of larvae of Lucilia cuprina, F. G. Lennox (*Austral. Council Sci. and Indus. Res. Pam. 90 (1939), pp. 24, pl. 1, figs. 8*).—A description is given of a technic for the cultivation of larvae of *L. cuprina* in small, flat-walled bottles. "Growth is recorded, without opening the cultures, by photographing the larvae at a standard magnification. The evolution of a basal medium for the aseptic cultivation of the larvae is also described. It contains only yeast and sodium chloride, in addition to agar, which is added to give a suitable gel consistency. Although larvae reach full size on this medium, growth is more rapid on an enriched medium containing fresh egg white in place of the agar. The pH limits for growth on synthetic media are wide and vary from below 4 to beyond 8 or 10, the exact upper limit depending on the composition of the medium."

A note on rearing houseflies, C. Eagleson and R. Benke. (U. S. D. A.). (*Soap, 14 (1938), No. 11, pp. 109, 119, fig. 1*).

The generative organs of the blowfly Calliphora erythrocephala L., with special reference to their musculature and movements, G. S. Graham-Smith (*Parasitology, 30 (1938), No. 4, pp. 441–476, figs. 16*).

New genera and species of muscoid Diptera, H. J. Reinhard. (Tex. Expt. Sta.). (*Bul. Brooklyn Ent. Soc., 34 (1939), No. 2, pp. 61–74*).—The genera *Clastoneuriopsis* and *Philocalia* are erected and new species are described as follows: *Emblemasoma* and *Sarcophaga* two species, and *Opsotheresia*, *Clastoneuriopsis*, *Philocalia*, and *Siphoclytia* one species each.

Breeding houseflies, E. G. Thomssen and M. H. Doner (*Soap, 14 (1938), No. 10, pp. 89, 90, 101, fig. 1*).—A description is given of a simplified and more convenient method of rearing and handling flies for use in experimental work.

Observation on white grub pupation, P. O. Ritcher. (Ky. Expt. Sta.). (*Jour. Kans. Ent. Soc., 12 (1939), No. 2, pp. 64–69*).—Data on the pupation depths of 320 white grubs belonging to 8 species of Kentucky May beetles are presented. "It was found that *Ph[yllophaga] hirticula* larvae usually pupate deep in the soil while larvae of *P. inversa* pupate at shallow depths. *P. futilis*, [*P.*] *fusca*, and [*P.*] *bipartita* usually seek intermediate depths for pupation. Certain factors such as soil structure, soil drainage, and soil moisture may affect the pupation levels, but they do not appear to change the relative positions of the various species. Differences in latitude appear to make little difference in the depth of pupation for a given species, other factors being equal."

New and little known Phyllophaga from Texas (Scarabaeidae, Coleoptera), H. J. Reinhard. (Tex. Expt. Sta.). (*Jour. Kans. Ent. Soc., 12 (1939), No. 2, pp. 47–63, figs. 13*).—This contribution includes descriptions of seven species and four subspecies of *Phyllophaga*, new to science, together with notes on four little known species previously described.

Descriptions of the three larval instars of the Japanese beetle (Popillia japonica Newm.) (Coleoptera, Scarabaeidae), A. G. Böving. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 41 (1939), No. 6, pp. 183–191, figs. 24*).

The probable future distribution of the Japanese beetle in North America, H. Fox (*Jour. N. Y. Ent. Soc., 47 (1939), No. 2, pp. 105–123*).

Revision of the beetles of the melolonthine subgenus Phytalus of the United States, L. W. Saylor (*U. S. Natl. Mus. Proc., 86 (1939), No. 3048, pp. 157–167, pls. 2*).—While engaged in this revision of beetles of the subgenus *Phytalus*, seven in number, the economic status of the majority of which species is little known, the author observed *P. pallida* Horn doing a good deal of damage in Arizona by eating the foliage of rose bushes, young fruit trees, and walnut trees, often stripping them.

Pathogenicity of Beauveria bassiana (Bals.) Vuill. on Colorado potato beetle larvae, M. I. Timonin (*Canad. Jour. Res., 17 (1939), No. 4, Sect. D, pp. 103–107, figs. 5*).—It was found that *B. bassiana*, isolated from infected larvae of the Colorado potato beetle, is pathogenic in this host. Experiments conducted indicate that some of the infected larvae "may pass through the larval stage, but owing to further mycelial growth finally succumbed in the pupal stage. The fungus does not attack the eggs, but infected young larvae were found dying on the fourth day after hatching, when the eggs had been dusted with *B. bassiana* spores. The mycelial growth on the infected larvae is more rapid in the soil than above ground."

The elm leaf beetle, C. W. Collins (*U. S. Dept. Agr. Leaflet 184 (1939), pp. [1]+6, figs. 3*).—A practical account.

Four wireworms found in bluegrass sod, H. H. Jewett (*Kentucky Sta. Bul. 392 (1939), pp. 107–118, figs. 18*).—Technical descriptions are given of four species of wireworms that live in bluegrass sod in Kentucky, some of which become pests of crops that follow sod in rotations. The four species, which have been found most frequently injuring tobacco plants, and are here described in detail, are: *Aeolus dorsalis*, *Conoderes auritus*, *C. bellus*, and *C. lividus*.

Description of the larva of Ludius divaricatus Lec., H. H. Jewett. (Ky. Expt. Sta.). (*Canad. Ent., 71 (1939), No. 5, pp. 105–108, figs. 2*).

The occurrence of Tribolium destructor Uytt. in seeds in England, C. Potter (*Ent. Mo. Mag., 3. ser., 25 (1939), No. 293, pp. 114, 115*).—The beetle *T. destructor*, introduced into England from Italy, is said to have become a pest of stored products, with indications that it may prove serious.

Notes on Coleoptera found in raisin storages, H. C. Donohoe. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 41 (1939), No. 5, pp. 154–162*).—Notes are given

on 32 insect forms found in raisin storages in Fresno and Tulare Counties of the San Joaquin Valley of California.

Studies on the coconut palm beetle Oryctes rhinoceros Linn. in South India, M. C. Cherian and K. P. Anantanarayanan (*Indian Jour. Agr. Sci., 9 (1939), No. 3, pp. 541–559, pl. 1*).—An account of the biology of *O. rhinoceros* in South India, with notes on control measures.

The giant palm borer (Coleoptera Bostrichidae), an economic pest in lower California, A. E. Michelbacher and E. Ross. (Univ. Calif.). (*Calif. Dept. Agr. Bul., 28 (1939), No. 2, pp. 166–169, figs. 3*).—The giant palm borer *Dinapate wrighti* Horn, of which the Washington palm is the host and which may be almost completely destroyed by the borings of the larvae, is said to have a very limited distribution, appearing in Palm Canyon, Calif., and at Catavina, Lower California (Mexico), some 300 miles to the south.

Cryptorhynchus lapathi L. in relation to the watermark disease of the cricket-bat willow, E. M. Callan (*Ann. Appl. Biol., 26 (1939), No. 1, pp. 135–137*).—Although the poplar and willow borer has been found occasionally attacking the bat willow (*Salix alba caerulea* Smith) it has not yet been associated with the watermark disease in the field.

The white fringed beetle [Naupactus leucoloma Boh.] a serious threat to southern agriculture, J. R. Watson. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc., 51 (1938), pp. 127–129*).

The species of Pantomorus of America north of Mexico, L. L. Buchanan (*U. S. Dept. Agr., Misc. Pub. 341 (1939), pp. 40, figs. 5*).—Report is made of a taxonomic study of a group of scarred-snout beetles which includes species of considerable importance, as Fuller's rose beetle and the recently introduced South American white-fringed beetle *Naupactus leucoloma* Boh. In the region north of Mexico the genus has been found represented by 4 subgenera, 11 species, and 3 varieties. Those described as new are the 2 subgenera *Graphognathus* (type, *N. leucoloma*) and *Atrichonotus* (type, *N. taeniatulus* Berg), the 2 species *peregrinus* (type locality, Gulfport, Miss.) and *planitiatus* (type locality, Pueblo, Colo.), and 1 variety *elegans eximius* (type locality, San Diego, Tex.). The new synonymy is as follows: *taeniatulus* Berg (=*texanus* Pierce 1911), *elegans elegans* (Horn) (=*metallicus* Pierce), *candidus* (Horn) (=*nebraskensis* Pierce), and *texanellus* new name (=*texanus* Pierce 1913). Two previously "lost" generic names belonging to the *Pantomorus* complex (*Aomopactus* Jekel 1876 and *Pantopactus* Jekel 1876) are noted. Parthenogenesis has been demonstrated for *P. leucoloma* and *P. godmani* and probably occurs also in *P. peregrinus*, *P. taeniatulus*, *P. tessellatus*, and *P. pallidus*. Of these 6 species *P. leucoloma* and *P. taeniatulus* are known to be native to South America and the other 4 are probably also South American. The gamogenetic species and varieties which comprise the subgenus *Phacepholis* are all indigenous to North America.

The plum curculio in Tennessee, S. Marcovitch and W. W. Stanley. (Tenn. Expt. Sta.). (*Tenn. State Hort. Soc. Proc., 34 (1938), pp. 86–88*).

Studies on American foul brood of bees, III, IV, H. L. A. Tarr (*Ann. Appl. Biol., 25 (1938), No. 4, pp. 807–821, pls. 3*).—A continuation of this contribution (E. S. R., 80, p. 664) from the Rothamsted Experimental Station, presented in two parts.

III. *The resistance of individual larvae to inoculation with the endospores of Bacillus larvae.*—The author reports having failed to produce American foulbrood by direct inoculation of eggs, or larvae from the time of hatching to that just subsequent to sealing, by placing "from 0.001 to 0.005 cc. of aqueous suspensions of washed spores of *B. larvae*, obtained from natural sources, in their cells. With this method of oral inoculation, larvae are rarely removed by the bees and mature normally when each receive from a few thousand

to over 45×10^6 spores of *B. larvae*. Feeding individual larvae with unwashed spores of *B. larvae*, or with portions of crushed larvae recently affected with American foulbrood, does not cause the disease. Methods of inoculation, in which the adult bees are allowed access to relatively dilute suspensions of *B. larvae* spores, form a satisfactory means of initiating American foulbrood in colonies of bees. It is inferred that adult bees play an important part in carrying American foulbrood in the colony, and the possible role of the adult bee as 'insect vector' of American foulbrood is considered."

IV. *On the attempted cultivation of Bacillus pluton, the susceptibility of individual larvae to inoculation with this organism, and its localization within its host.*—It was found that *B. pluton* "will not grow on the chorioallantoin membrane of the developing chicken embryo or on embryo brei medium made from minced embryos. European foulbrood is a purely intestinal infection of the bee larva, the causal organism being localised in the food mass within the peritrophic membrane. Young larvae are readily infected with European foulbrood by mixing relatively small numbers of *B. pluton* organisms, obtained from recently affected larvae, with the brood food surrounding them."

The control of meat ants (Iridomyrmex detectus Sm.), T. GREAVES (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 2, pp. 109–114*).

On some larval stages of two species of Ichneumonidae, Bassus tetragonus Thunb. and Homocidus fissorius Grav., parasitizing Sphaerophoria flavicauda Zett. (Diptera, Syrphidae), M. L. BHATIA (*Parasitology, 30 (1938), No. 4, pp. 502–510, figs. 11*).—This contribution deals mainly with the larvae of *B. tetragonus*.

Two new chalcidoid parasites of the linseed midge Dasyneura lini Barnes, I, II (*Indian Jour. Agr. Sci., 9 (1939), No. 3, pp. 531–539, pl. 1*).—Part 1 of this contribution (pp. 531–535), which is by T. Ahmad, deals with the biology and morphology of *Systasis dasyneurae* Mani; part 2 (pp. 535–539), by M. S. Mani, consists of a description of its parasites, namely, *S. dasyneurae* n. sp. and *Ecrizotomorpha taskhiri*, n. g., n. sp.

The phytophagous chalcidoid Eurytoma samsonovi Vas., a serious pest of apricot and some other fruits in India, H. S. PRUTHI and H. N. BATRA (*Indian Jour. Agr. Sci., 9 (1939), No. 2, pp. 277–283, pl. 1*).—Observations on the biology of *E. samsonovi*, which attacks apricot, peach, etc., in the North-West Frontier Province of India, are reported.

The control of the woolly aphis by Aphelinus mali, L. J. DUMBLETON and F. J. JEFFREYS (*New Zeal. Jour. Sci. and Technol., 20 (1938), No. 3A, pp. 183A–190A, fig. 1*).—Records of the percentage of parasitism in the field by *A. mali* are presented, and factors influencing the extent to which the aphid is controlled by the parasite are considered.

The life history of Allotropa utilis Mues., a hymenopterous parasite of the orchard mealybug [Phenacoccus aceris Sign.] in Nova Scotia, F. C. GILLIATT (*Canad. Ent., 71 (1939), No. 7, pp. 160–163, fig. 1*).—A report of observations of the biology of the parasite above noted. Its parasitism seems to fluctuate according to the abundance of the host, varying from 50 to 66 percent in orchards when the host is abundant and from 2 to 15 percent where the mealybug is not numerous.

A new mealybug parasite (Hymenoptera: Scelionidae), C. F. W. MUESEBECK (U. S. D. A.). (*Canad. Ent., 71 (1939), No. 7, pp. 158–160, fig. 1*).—Under the name *Allotropa utilis*, a description is given of a scelionid parasite of the orchard mealybug *Phenacoccus aceris* (Sign.) in Nova Scotia.

Epimegastigmus (Megastigmus) brevivalvus Girault: A parasite of the citrus gall wasp Eurytoma fellis Girault, with notes on several other species of hymenopterous gall inhabitants, N. S. NOBLE (*N. S. Wales Dept.

Agr., Sci. Bul. 65 (1938), pp. 46, figs. 18).—Accounts of the morphology and biology of *Epimegastigmus brevivalvus* (pp. 5–30), *E. trisulcus* Gir. (pp. 31–34), and *Epibootania nonvitta* Gir. (pp. 35–40) are followed by a discussion of the relative abundance of the various species of parasites of *Eurytoma fellis* in the Grafton District, New South Wales. The accounts include a list of 27 references to the literature cited.

Further notes on Trichogramma semblidis, G. Salt (*Parasitology, 30 (1938), No. 4, pp. 511–522, figs. 3*).—The author has found several "behavioristic and physiological differences [to] distinguish the two species *T. semblidis* and *T. evanescens*. There are no true intermediates between the two forms of the male *T. semblidis*, but intermediate types are simulated by degenerate individuals of small size produced by starvation. Among 1,740 males reared from eggs of *Sialis* and 1,847 reared from eggs of moths, there were only 19 exceptions to the rule that the apterous form emerges from the former and the winged form from the latter. The ability of *T. semblidis* to produce its apterous male can remain latent through as many as 64 generations reared on *Sitotroga* and yet find its full expression immediately when the parasite is reared on *Sialis*. Several other species of Neuroptera have been parasitized, but *S. lutaria* remains the only known host that regularly elicits the apterous form. *T. semblidis* is capable of arrhenotokous parthenogenesis. The statement that the species includes thelytokous strains requires corroboration."

A new reared Meteorus from Tasmania (Hymenoptera: Braconidae), C. F. W. Muesebeck. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 41 (1939), No. 5, pp. 172, 173*).—Under the name *M. dumbletoni* a description is given of a new braconid parasite reared from *Tortrix postvittana* Walker in Hobart, Tasmania.

A species of gall-mite (Eriophyidae) injurious to tomato, A. M. Massee (*Ann. and Mag. Nat. Hist., 11, ser., 3 (1939), No. 18, pp. 617–619, fig. 1*).—A gall mite that produces whitish pilose areas on the stems and young fruitlets of the tomato plant in Morocco, the damage by which is somewhat similar to that produced by *Phyllocoptes lycopersici* Massee (E. S. R., 78, p. 673), is described as new under the name *Eriophyes lycopersici*. Its distribution is said to include all the tomato-growing districts extending for 120 miles along the seacoast of Morocco.

The relation of mites to animals and plants in South Africa, R. F. Lawrence (*So. African Jour. Sci., 35 (1938), pp. 332–338*).

Eriophyid studies, III, H. H. Keifer (*Calif. Dept. Agr. Bul., 28 (1939), No. 2, pp. 144–162, figs. 14*).—A continuation of the earlier studies (E. S. R., 81, p. 254) in which 15 species are described as new.

Ornithodoros talaje on the California mainland, T. H. G. Aitken. (Univ. Calif.). (*Pan-Pacific Ent., 15 (1939), No. 1, pp. 12, 13*).—Report is made of the collection of specimens of *O. talaje* in the Mojave Desert near Palmdale, San Bernardino County, Calif. This is believed to be the first actual record of its collection on the California mainland. Reference is also made to a later collection in Contra Costa County at an altitude of 2,000 ft.

The development of Moniezia expansa in the intermediate host, H. W. Stunkard (*Parasitology, 30 (1938), No. 4, pp. 491–501, pl. 1*).—It was found that when eggs of *M. expansa* are fed to galumnid mites, "the onchospheres emerge in the intestine and migrate to the body cavity. Here they undergo metamorphosis and develop into cysticercoids. The dissection of mites, at various intervals after exposure, has yielded a successive series of developmental stages. Protocols of the experiments and photographs of living larvae are presented. These results demonstrate that mites serve as intermediate hosts of *Moniezia*, and probably also of other anoplocephaline cestodes."

ANIMAL PRODUCTION

[**Experiments with livestock in Mississippi**] (*Miss. Farm Res.* [*Mississippi Sta.*], *1* (*1938*), *Nos. 1, pp. 4, 5, fig. 1; 2, pp. 5, 7, 8; 3, p. 6; 2* (*1939*), *Nos. 1, p. 5; 2, pp. 4, 8; 3, p. 3; 4, pp. 3, 7; 5, pp. 2, 6*).—Progress reports of numerous lines of investigation are presented in brief articles as follows: Vol. 1, No. 1, Green Crops for Laying Hens Mean More Eggs and Less Feed, by G. R. Sipe, and Twenty-five Dollar Cows Produce Spring Calves Worth as Much, by E. W. Sheets; No. 2, Rye Grass, Mustard, and Bermuda in Year-Round Poultry Grazing, by G. R. Sipe; Home Grown Feed and Green Forage Essential in Pork Production, by P. G. Bedenbaugh and H. H. Leveck; and Feeding Practices for the Work Mules, by R. H. Means; No. 3, Cottonseed Meal for Hogs Being Tested, by P. G. Bedenbaugh and H. H. Leveck; Vol 2, No. 1, Efficient Production and Usage of Roughages a Major Farm Problem, by E. W. Sheets; No. 2, Good Pasture Most Profitable Feed Source for Dairy Cattle, by J. S. Moore; and Choice Spring Lambs From Good Pasture, by H. H. Leveck; No. 3, Mineral Deficiencies in Livestock New Approach to Old Problem, by E. W. Sheets and V. R. Berliner; No. 4, Dairy Calves Showing Symptoms of Vitamin A Deficiency Respond to Treament With Cod Liver Oil, by W. C. Cowsert; The Effect of Ration on Colt Production—Feeding Breeding Sires, by F. E. Cowart and V. R. Berliner; and Successive Grazing Crops for Producing Home Supply of Pork on Small Farms, by E. W. Sheets; No. 5, Cottonseed Meal for Broilers, by H. D. Polk, and Corriedale Rams With Native Ewes Mean Increased Wool Production, by H. H. Leveck

[**Livestock investigations in New Mexico**] (*New Mexico Sta. Rpt. 1938, pp. 32, 33, 35–41, 85–87, fig. 1*).—Reports of progress (E. S. R., 79, p. 85) are presented for studies on the natural revegetation of ranges under controlled and limited grazing and the carrying capacities of ranges, the rate of increase or decrease of pingue on grazed and protected areas, the calcium and inorganic phosphorus content in the blood of range cattle, the composition of range grasses and browse gathered at varying stages of maturity, cottonseed meal as a concentrate for fattening yearling steers, the amount of cottonseed meal required to supplement hegari fodder and hegari grain in lamb-fattening rations, and battery cages v. pen management of laying pullets.

Commercial feeding stuffs, H. R. Kraybill et al. (*Indiana Sta. Cir. 249* (*1939*), *pp. 39, fig. 1*).—This condensed report of the commercial feed inspection for 1938 (E. S. R., 79, p. 522) covers 3,180 samples of feeding stuffs examined during the year with an indication of the number failing to meet the standard specifications. The average and range of analyses are given for 112 samples of canned dog foods examined. Definitions of a large number of feeding stuffs as approved by the Association of American Feed Control Officials are also presented.

Caking mature steers on pasture, R. H. Means (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *No. 5, pp. 3, 4*).—Three trials were conducted to determine whether cottonseed meal or cake could be fed profitably to mature steers grazing on good pasture, the level at which cottonseed cake or meal might be fed most economically, and the most profitable length of the grazing and feeding period. Grade Jersey or "Yellow Hammer" steers were used in the first trial, first-cross steers from native cows by beef-type bulls in the second, and good grade beef-type steers in the third trial. In each case the three groups of steers received 0, 2.5, and 5 lb. of cottonseed meal per head daily, respectively. In each instance the feeding of cottonseed meal proved to be unprofitable. In the first two trials steers receiving cottonseed meal made only slightly greater average daily gains than those receiving no supplement, with practically no difference between the

groups receiving the two levels of meal. In the third trial the average daily gains were considerably greatest for the supplemented lots, but the increased market value of these steers was more than offset by the cost of the supplement.

Spring vs. fall calving, R. H. MEANS (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *No. 5, pp. 5, 6, figs. 5*).—A 3-yr. comparison was made of the returns secured from fall-born v. spring-born beef calves, the observations extending over the time of breeding the dams through the feeding and slaughtering of the calves. The advantages derived from spring calves were a higher percentage calf crop, slightly less feed required over the entire growth and finishing period, the calves finishing at about 42 days younger age, and less trouble from screwworm infestation. The advantages derived from fall calves were approximately 2 mo. longer suckling period with the dams in better condition at weaning time, a price advantage when calves were marketed as feeders at weaning time, approximately 30 days shorter finishing period, and a higher average price for Good and Choice cattle during the market period for finished fall-born calves. The results appeared to warrant consideration of the production of fall-born as well as spring-born calves.

Tankage, a protein supplement for fattening beef calves, J. W. WILSON and T. WRIGHT (*South Dakota Sta. Bul. 329* (*1939*), *pp. 15, figs. 6*).—Results are summarized for three separate feeding trials comparing the rate and economy of gain of fattening beef calves on a basal ration of shelled corn and alfalfa hay, when (1) no protein supplement, (2) linseed meal, (3) cottonseed meal, (4) dry-rendered tankage, and (5) a 1:1 mixture of linseed meal and tankage were added to the diet. The average daily gains per calf were 2.23, 2.37, 2.39, 2.21, and 2.35 lb. in lots 1 to 5, respectively. The tankage proved less palatable than linseed or cottonseed meal, the steers consuming only about one-half as much of the former supplement as of the latter two. The mixed supplement was intermediate in palatability. Calves in the cottonseed meal group showed the best finish and commanded the highest average selling price, closely followed by the mixed supplement and linseed meal groups, while the tankage-fed lot only slightly excelled the no-supplement group in degree of finish. The mixed animal and vegetable protein supplement did not prove superior to either of the straight vegetable supplements. In two trials in which a lot fed shelled corn, wild hay, and tankage were included, the calves consumed about 1 lb. of tankage per head daily, or approximately twice as much as a comparable group receiving alfalfa hay.

Breeding ewe lambs, D. L. HUME (*North Dakota Sta. Bimo. Bul.*, *1* (*1939*), *No. 6, pp. 7, 8*).—In a further report of this line of investigation (E. S. R., 75, p. 91), results of a second trial comparing groups of purebred Shropshire, Hampshire, and Southdown ewes bred as lambs and as yearlings essentially agreed with those of the former trial which involved the same comparison with grade ewes. At 35 mo. of age the yearling-bred ewes averaged 13.7 lb. heavier than the lamb-bred ewes, but at 48 mo. of age differences in weight were not significant. A comparison of the performance of the two groups as 2-year-olds showed that the lamb-bred ewes raised a higher percentage of lambs than the yearling-bred ewes. Lamb-bred Hampshires dropped lighter lambs but weaned heavier ones than the yearling-bred group, while yearling-bred Shropshires dropped and weaned heavier lambs. The effect of age of breeding on the percentage of twins dropped varied between breeds and also within breeds from year to year so that the results on this point are inconclusive. In general, it is recommended that purebred ewe lambs of the above breeds should not be exposed to breeding before they are 10 mo. of age and, further, that ewe lambs should not be bred unless the best of care can be given them.

Economical production of pork demonstrated in two experiments (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *No. 7, pp. 1, 8*).—A summary of pig-feeding trials at the main station and the Delta Substation gives evidence that through the use of properly balanced rations consisting largely of home-grown feeding stuffs, pastures, and good management pork can be produced at from 4 to 6 ct. per pound at prevailing feed prices.

In the report by H. H. Leveck a ration containing corn and soybeans (85: 15) when fed to pigs on green pasture gave relatively low-cost gains and resulted in a satisfactory quality of pork as compared with a corn and tankage ration.

In the report by W. P. McFadden a ration of corn and cottonseed meal (70: 30) when hand-fed to pigs on alfalfa pasture gave relatively economical and satisfactory gains. Under these conditions the addition of 5 percent of tankage to the concentrate ration was not justified. Less satisfactory results were obtained by feeding the corn and cottonseed meal ration to pigs on wheat or Sudan grass pasture. When cottonseed meal is fed to pigs on such pasture a ration of corn, tankage, and cottonseed meal (85: 7.5: 7.5) is recommended.

[**Poultry investigations in Rhode Island**] (*Rhode Island Sta. Rpt.* [*1938*], *pp. 56, 57*).—Progress results are noted on a study of the effect of varying levels of alfalfa leaf meal on hatchability, egg yolk color, and livability of adult birds.

The significance of body weight in breeding for egg production, F. A. Hays (*Massachusetts Sta. Bul. 364* (*1939*), *pp. 16, figs. 4*).—Employing the data obtained on 2,283 Rhode Island Red pullets, the relationship between body weight and various characters related to egg production was determined. The pullets showed the highest rate of gain during the first month of laying, with a continued gradual gain until mature weight was attained at 11 or 12 mo. of age. Considerable parallelism was observed between the mean monthly body weight and mean monthly egg weight, also between monthly body weight and monthly egg production. The highest level of egg production occurred in March and April when body weight was at a maximum. Satisfactory winter egg weight and egg production were not obtained unless pullets averaged 1 lb. gain in weight during the laying year. Increases greater than 1 lb. in weight were accompanied by heavier winter eggs. There was a consistent decline in mortality in the laying house as the weight of pullets at the time of housing increased. It is concluded that body weight offers a valuable guide to the poultry breeder, particularly from the standpoint of egg size and extent of laying house mortality.

Egg production and livability of pullets as affected by management, D. C. Kennard and V. D. Chamberlin. (Ohio Expt. Sta.). (*Poultry Sci., 18* (*1939*), *No. 4, pp. 318–322*).—Five systems of management of chicks and growing pullets, with representatives from each group kept in floor pens and in laying cages during the laying year, were compared in this experiment. None of the management practices proved more than partially effective in reducing the mortality of pullet layers. Chicks having access to isolated range after 2 weeks proved superior, both in egg production and livability, to those confined to wire sun porches from 8 to 10 weeks before being placed on range. Egg production in floor pens averaged highest for those pullets reared on the isolated range. In practically all cases livability and total egg production of pullet layers in laying batteries were better than similarly raised pullets kept in floor pens. Pullets brooded and reared in batteries generally proved unsatisfactory when placed in floor pens during the laying year, whereas they were generally satisfactory when continued in batteries during the laying period.

Breed variations in egg characters, G. O. Hall. (Cornell Univ.). (*Poultry Sci., 18* (*1939*), *No. 4, pp. 282–287*).—A statistical analysis of various egg char-

acters for the White Wyandotte, Barred Plymouth Rock, Rhode Island Red, and Single Comb White Leghorn revealed no significant breed differences in egg weight, weight of yolk, weight of total white, height of albumin, yolk index, percentage of total yolk, and percentage of total white. Compared with eggs of other breeds and with the average of all breeds, the Barred Plymouth Rocks were lower in weight of shell, percentage of shell, and weight and percentage of inner thin white, but had a greater amount and higher percentage of thick white. Similarly, eggs from Rhode Island Reds had a significantly higher percentage of inner thin white and eggs from White Leghorns a significantly higher percentage of outer thin white. The White Wyandottes differed significantly from the Rhode Island Reds and White Leghorns and from the mean of all breeds in observed score of condition of firm albumin. Meat spots were more numerous in eggs of Plymouth Rocks and Rhode Island Reds.

Effect of varying levels of wheat bran on age at sexual maturity, L. W. Taylor and I. M. Lerner. (Univ. Calif.). (*Poultry Sci., 18 (1939), No. 4, pp. 323–326*).—Groups of Single Comb White Leghorn chicks were reared on well-balanced rations containing 0, 15, and 25 percent of red wheat bran, respectively. The inclusion of either the 15 or 25 percent level of bran resulted in more rapid growth of the chicks, earlier sexual maturity of the pullets, and, as a direct result of the latter, lower egg weight at the beginning of the laying period. Such changes in the ration did not affect annual egg production, March egg weight, nor the extent and kind of pathology occurring among pullets.

The calcium and phosphorus contents of chickens of various ages, J. R. Haag. (Oreg. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 4, pp. 279–281*).—Data are presented on the live weight and the calcium and phosphorus contents of the bodies of chickens at 0, 2, 4, 8, 12, 16, and 20 weeks of age. The calcium: phosphorus ratio gradually widened with advancing age, ranging from approximately 1.3 in day-old chicks to about 1.7 at 20 weeks. Comments regarding the usefulness and limitations of these data are included.

The effect of high temperature on the blood calcium of the laying hen, R. M. Conrad. (Kans. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 4, pp. 327–329*).—In a series of experiments in which hens were maintained at various constant levels of temperature and relative humidity, it was found that high temperature materially affected the blood calcium of the hens. An increase in temperature from 70° F. to about 90° caused a decrease of from 25 to 30 percent in the blood calcium level. Such changes were not due apparently to decreased calcium intake at the higher temperature. The effect of high temperature on the thickness of eggshell probably can be attributed directly to the decreased calcium-carrying capacity of the blood.

Effect of single cereal grains upon the hatchability of eggs and subsequent growth of chicks, V. D. Call and H. L. Wilcke. (Iowa Expt. Sta.). (*Poultry Sci., 18 (1939), No. 4, pp. 308–317*).—Four groups of yearling hens were fed and managed under similar conditions except for the source of grain in the ration. Groups 1 to 4 received corn, wheat, oats, and a complex grain mixture (control), respectively. Mortality was high in all lots of breeders, ranging from 14.3 percent in the oat lot to 46.4 percent in the corn lot. Wheat as the only grain produced diarrhea in the adult birds which apparently contributed to high mortality. Egg production was highest for the mixed grain group, closely followed by the corn-fed lot, while the oat-fed lot was consistently lower and the wheat group less than half that of the control lot. Fertility was not significantly different on the various rations. Hatchability was best from the wheat-fed group, closely followed by the oat lot, while the other two

groups were somewhat lower and about equal. Chicks from hens fed oats or wheat were more vigorous than those from corn-fed hens. However, the grain ration of the parental stock had little apparent effect on subsequent growth rate of chicks.

The efficiency of carotene as supplied by alfalfa meal in meeting the vitamin A requirements of laying hens, J. K. Williams, C. E. Lampman, and D. W. Bolin. (Idaho Expt. Sta.). (*Poultry Sci., 18 (1939), No. 4, pp. 268-275*).—A series of experiments was conducted in which laying hens received a basal diet low in vitamin A but adequate in other known dietary factors supplemented with alfalfa meal at such rates as to provide 0.1, 0.2, 0.25, 0.3, 0.4, and 0.5 mg. of carotene per bird daily. Birds receiving 0.2 mg. of carotene per day, equivalent to 333 U. S. P. units or 238 Sherman-Munsell units of vitamin A, maintained good body weight and fair egg production with good hatchability and failed to develop deficiency lesions in the throat, whereas 0.1 mg. per bird daily was definitely insufficient to prevent deficiency symptoms. Increasing the alfalfa meal intake to provide 0.5 mg. of carotene per bird daily slightly increased egg production but otherwise did not seem to benefit the hen. The higher level resulted in a higher vitamin A potency of the eggs, better livability of the chicks, and a greater storage of vitamin A in the livers of the hens.

Further studies on the riboflavin requirements of the chicken, C. H. Hunt, A. R. Winter, and R. M. Bethke. (Ohio Expt. Sta.) (*Poultry Sci., 18 (1939), No. 4, pp. 330-336*).—In one experiment involving only laying hens and in a second involving chicks from day old to 40 weeks of age, groups of birds were fed (1) a basal diet of corn, wheat, wheat bran, Argentine casein, steamed bonemeal, oystershells, salt, and cod-liver oil; (2) basal diet plus 5 percent of alfalfa leaf meal; (3) basal diet plus 10 percent of alfalfa leaf meal; (4) basal diet plus 5 percent of dried skim milk; (5) basal diet plus 10 percent of dried skim milk; and (6) basal diet plus 5 percent each of alfalfa meal and dried skim milk. These rations supplied 0.8, 1.5, 1.9, 1.6, 2.3, and 2.2 μg. of riboflavin per gram of ration, respectively. The amount of feed consumed per hen increased as the riboflavin content of the ration increased. The riboflavin content of eggs varied directly with that in the hen's ration. Eggs of highest riboflavin content gave highest hatchability, and chicks from such eggs showed greatest livability when subjected to a riboflavin-deficient diet. Chicks required approximately from 190 to 200 μg. of riboflavin per 100 gm. of ration to attain maximum growth from 1 to 12 weeks of age, while from 220 to 230 μg. were required in laying rations to give good hatchability of eggs. It appeared that somewhat less riboflavin was required for good egg production than for maximum hatchability.

A curative method for the assay of vitamin D with chicks, J. S. Carver, V. Heiman, and J. W. Cook. (Wash. Expt. Sta.). (*Poultry Sci., 18 (1939), No. 4, pp. 288-294, figs. 5*).—The technic described consists essentially in depleting day-old sexed chicks for from 8 to 10 days on a vitamin D-deficient, low-mineral ration, and then feeding the vitamin D ration to be assayed for a 24-day period. The interpretation of the assay can be made on the basis of the growth response, the degree of healing of the tibia, or the percentage of ash in the tibia. By projecting onto a straight line of best fit either of these criteria over the negative control, the vitamin D unitage may be determined by interpolation.

The limit of accuracy of the A. O. A. C. chick assay for vitamin D, B. L. Oser (*Jour. Assoc. Off. Agr. Chem., 22 (1939), No. 2, pp. 445-449*).—This discussion is based on a critical analysis of data submitted by 13 collaborators in the 1937 study of the A. O. A. C. chick assay for vitamin D. In the opinion

of the author, the minimum significant difference in bone ash value between assay groups should be twice the standard error, e. g., between two groups of 10 chicks each, two times 1.366 or 2.73 percent.

Egg deterioration due to ingestion by hens of malvaceous materials, F. W. LORENZ. (Univ. Calif.). (*Poultry Sci., 18 (1939), No. 4, pp. 295–300, fig. 1*).—In a study of factors responsible for olive-yolk and pink-egg types of egg deterioration, nine groups of birds received supplements of (1) petroleum ether extract of raw cottonseed, equivalent to 5 percent cottonseed; (2) purified gossypol, 0.35 gm. per bird fed by capsule in six doses of from 0.05 to 0.06 gm. each; (3) mother liquor (tar) from gossypol preparation, equivalent to 15 percent cottonseed; (4) completely extracted cottonseed, 5 percent of the ration; (5) raw decorticated cottonseed, 5 percent; (6) petroleum ether extract of *Malva parviflora* seeds, equivalent to 10 percent raw seeds; (7) ethyl ether extract of the above-extracted seeds, 10 percent equivalent; (8) completely extracted *M. parviflora* seeds, 10 percent; and (9) young green *M. parviflora* leaves ad libitum. Two distinct substances were found to be present in cottonseed or cottonseed meal. Gossypol gave the yolk an olive-green color and a gelatinous consistency, while the other substance, which is either identical or closely associated with the substance responsible for the Halphen reaction, caused an abnormal enlargement of the yolk and a reddish color of yolk and albumin to develop in storage. Eggs from hens fed cottonseed developed a combination of these abnormalities. The Halphen substance was contained in other members of the plant family Malvaceae, and eggs from hens fed such plants developed only the second group of defects.

Fishy flavor in turkey meat caused by feeding menhaden fish meal, R. L. BRYANT and G. T. STEVENSON (*Virginia Sta. Bul. 321 (1939), pp. 7*).—Four groups of Bronze turkey poults were fed rations containing 20 percent of flame-dried menhaden fish meal, 20 percent of steam-dried fish meal, 20 percent of meat scrap, and a combination of 10 percent each of fish meal and meat scrap, respectively, to 21 weeks of age, at which time all the fish meal in the rations was replaced by an equivalent amount of meat scrap. Representative birds from each group were killed, roasted, and scored for flavor at 21 weeks of age and at 2-week intervals thereafter until all traces of fishy flavor were eliminated from the cooked carcasses. Fishy flavor was detected in the roasted carcasses of turkeys receiving 10 percent or more of fish meal. Fishy flavor was eliminated within 4 weeks after the 10-percent level of fish meal feeding was discontinued and within 8 weeks after the 20-percent level was discontinued. The drippings had a more pronounced fishy flavor than did the meat, and male birds exhibited a slightly stronger fishy flavor than females. There was no marked difference in intensity of fishy flavor between the lots receiving the flame-dried and steam-dried meals.

Sulfured soil for poultry yards, M. W. EMMEL. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 94 (1939), No. 4, pp. 409, 410*).—Preliminary studies gave evidence that heavy applications of commercial flour sulfur to poultry yards on which chickens are constantly confined proved an effective way of eliminating or greatly reducing various types of intestinal parasites.

DAIRY FARMING—DAIRYING

Timothy hay compared with alfalfa hay as a feed for dairy cows: Supplemental factors influencing the milk-producing value of alfalfa hay and timothy hay in feeding dairy cows, C. W. HOLDAWAY, W. B. ELLETT, J. F. EHEART, and A. D. PRATT (*Virginia Sta. Tech. Bul. 65 (1939), pp. 39*).—The results of a series of experiments, extending over a period of 10 yr. and in

part previously noted (E. S. R., 68, p. 662), are summarized. The grain mixtures supplementing these hays were so adjusted as to provide equal levels of protein intake on the two rations, equal quantities of both hay and grain being fed to the two groups of animals during the test periods. The nutrients in the alfalfa hay rations proved slightly more digestible than those in the timothy hay rations. The addition of minerals with or without yeast did not affect the digestibility of the nutrients. The unsupplemented timothy ration produced an average of 87.5 percent and when supplemented with minerals 90.7 percent as much 4-percent milk as the alfalfa rations. The addition of dicalcium phosphate and calcium carbonate improved the efficiency of the timothy ration, and the addition of 10 gm. of yeast per cow daily to the above ration further improved its efficiency. The addition of bonemeal plus 100 gm. of yeast per cow daily materially decreased the amount of total digestible nutrients required from the timothy ration per unit of 4-percent milk produced. The milk production on the supplemented timothy ration compared more favorably with that on the alfalfa ration during the fourth to tenth months of lactation than during the first 3 mo. of the milking period, but on the average the milk production was in direct proportion to the total digestible nutrient intake within a 1-percent range. Thus it appeared that timothy hay of good quality will give efficient results as a roughage in the dairy cow's ration if the supplementary grain ration is properly balanced to supply the deficiencies in protein and minerals of the timothy hay.

A comparison of alfalfa silages prepared by the A. I. V. and molasses methods, D. M. HEGSTED, F. W. QUACKENBUSH, W. H. PETERSON, G. BOHSTEDT, I. W. RUPEL, and W. A. KING. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 7, pp. 489–500, figs. 2*).—Continuing this line of investigation (E. S. R., 78, p. 240), alfalfa silages prepared by the A. I. V. and molasses methods were compared both on the basis of chemical analyses and the quantity and quality of milk produced during feeding trials. Alfalfa containing from 20 to 25 percent of dry matter was well preserved by either method. The protein and carotene were somewhat better preserved by the A. I. V. method, although there was no pronounced difference in the lots. No significant differences in milk production were obtained when rations containing A. I. V. or molasses alfalfa silage or corn silage plus linseed meal were fed. The carotene and vitamin A contents of the butterfat produced on either of the alfalfa silages were relatively high. The milks from the three above lots were approximately equal in growth-promoting properties when fed to rats. The molasses silage appeared equal to the A. I. V. silage and was considered more suitable for general farm use.

Inadequacy of a whole milk ration for dairy calves as manifested in changes of blood composition and in other physiological disorders, G. H. WISE, W. E. PETERSEN, and T. W. GULLICKSON. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 7, pp. 559–572, figs. 8*).—Twelve normal dairy calves were confined to a diet consisting solely of whole milk from birth. The calves varied widely in their responses to the diet, both in rate of growth and abnormalities developed. One calf died at 55 days of age, while at the other extreme one was maintained on the diet for 324 days before being removed from the experiment. The following abnormalities were observed among the calves at various times—general unthrifty appearance, anorexia, cachexia, dyspnea, occasional nervousness and tetany, rachitic condition, dysphagia, and digestive disturbances. Blood analyses revealed high but variable blood sugar values, extremes in fat of plasma with generally high values, a decrease in hemoglobin, a gradual downward trend in plasma magnesium, occasional cases of hypophosphoremia, and rarely cases of hypocalcemia. Post mortems of calves dying on

experiment revealed hypertrophied livers with evidence of fatty degeneration, gastritis, enteritis, and nephritis.

Value of various vitamins and inorganic salts for overcoming symptoms manifested in calves restricted to a whole milk ration, G. H. WISE, T. W. GULLICKSON, and W. E. PETERSEN. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 7, pp. 573–582, figs. 3*).—Seven calves from the above experiment were removed from the sole milk diet at various ages and stages of malnutrition and placed on supplemented whole milk diets. Nearly all of the recognizable symptoms of the syndrome developed on the sole milk ration were temporarily remedied by supplying milk with ferric chloride, cupric sulfate, magnesium carbonate, and cod-liver oil. The adequacy of this supplemented diet was not demonstrated beyond the stage of advanced gestation. A depraved and erratic appetite persisted in calves on the supplemented diet which may have been due to a dietary deficiency or to the physical nature of the ration. Other possible factors relating to this syndrome are discussed.

The determination of blood plasma carotene in the bovine using a photoelectric colorimeter, L. A. MOORE. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 7, pp. 501–511*).—A method is described for a simple phase separation of carotene from bovine blood and measuring the density of the extract by the use of the photoelectric colorimeter, thus permitting rapid determination of the concentration of carotene per unit of blood plasma by direct comparison of the galvanometer reading with a table of standard values. When petroleum ether with a boiling point of from 73° to 76° C. was used as the solvent and extraction carried out at from 10° to 12°, the epiphase gave true carotene values. Other precautions to be followed are outlined. Plasma stored at 2° showed no loss of carotene over a period of 3 weeks.

Effect of pasture upon the carotene content of blood plasma of the bovine, L. A. MOORE. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 7, pp. 513–519*).—Blood samples from dairy heifers and from cows in various stages of lactation were taken for carotene analysis shortly before and after the cows were turned on pasture in the spring. Marked breed differences under similar conditions of feeding were observed. The breeds ranked in increasing order of plasma carotene as follows: Brown Swiss, Holstein, Ayrshire, Jersey, and Guernsey, with little difference between the first three. Heifers within a breed had a definitely lower plasma carotene value than producing cows under both winter and pasture conditions. The increase in plasma carotene values after the cows were turned on pasture was marked and showed a steady increase for a considerable period. Cows producing the larger amount of milk within a breed generally showed a greater increase in plasma carotene content. Such increases were evident within 15 hr. after green feed was ingested.

Milk goat improvement (*New Mexico Sta. Rpt. 1938, pp. 59–61*).—The effect of outbreeding and inbreeding on purebred Toggenburg goats is briefly summarized.

The influence of three methods of cleaning the cream separator and cream storage temperature on the keeping quality of cream, W. J. CAULFIELD and W. H. MARTIN. (Kans. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 7, pp. 583–589, fig. 1*).—In a comparison made of the quality of cream, that from an unwashed separator decreased to second grade when held at 60° F. more quickly than cream cleaned by either the conventional method or the Rogers method (E. S. R., 77, p. 242). Storage temperature was found to exert a greater influence on keeping quality and the rate of acid development and proteolytic decomposition of cream than did the method of cleaning the separator. All samples changed from first to second grade in a short time when held at 80°.

The Rogers method of cleaning gave essentially as good results as the more laborious conventional method, but immersion of tinned steel or iron separator parts showed some dark discoloration after 2 weeks submersion in the trisodium phosphate-sodium chromate solution at from 85° to 92°.

Preliminary observations on the treatment of parchment paper with sodium or calcium propionate, H. Macy and J. C. Olson. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 7, pp. 527–534, figs. 2*).—Both salted and unsalted butters artificially contaminated with mold spores were wrapped in parchment paper which had been soaked either in sterile distilled water or in 8, 16, and 20 percent solutions of sodium or calcium propionate. After storage at 50° F. at high humidity for from 11 to 12 weeks the mold development was found to be markedly inhibited in those butters wrapped in the treated parchment, particularly those treated with the higher concentrations. The degree of inhibition was markedly greater in the salted butter.

Study of physical and chemical properties of the adsorption "membrane" around the fat globules in cream.—I, The effect of the adsorption "membrane" of synthetic creams on curd tension of cow's milk, N. P. Tarassuk and L. S. Palmer. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 7, pp. 543–558*).—A series of synthetic creams was prepared by emulsifying pure butterfat in aqueous sols of dried whey, skim milk powder, calcium caseinate, gelatin, and tissue fibrinogen. These synthetic creams were dispersed in normal milk plasma to give remade milks, these were separated to give remade creams, and remade buttermilks were prepared by churning the remade creams. The addition of rennet to the buttermilk from the dried whey cream either resulted in no clotting or in the formation of a very soft fragile curd, and buttermilks from the gelatin and calcium caseinate creams showed no visible coagulation on the addition of rennet. The addition of relatively large concentrations of calcium chloride to the above creams appreciably restored their curd tension values, but the cause of this phenomenon was shown to be more deep-seated than the simple addition of calcium. The fat globule adsorption membrane from the tissue fibrinogen cream had no effect and that from the dried skim milk cream only a slight effect towards reducing the curd tension of the buttermilk. The phenomenon of low curd tension or noncoagulation with rennet in these remade buttermilks was accompanied by considerably lower pH and lower surface tension of the buttermilks. Such failures to clot on the addition of rennet is attributable to the liberation of certain fatty acids which are adsorbed by the calcium caseinate. Curd tension is not seriously affected by butterfat hydrolysis except when an unnatural emulsifying agent is substituted for the natural fat globule adsorption membrane of cow's milk.

The use of steapsin in the manufacture of blue cheese, S. T. Coulter and W. B. Combs. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 7, pp. 521–525*).—In an effort to increase the rate of flavor development in Roquefort-type cheese by hastening fat hydrolysis, commercial steapsin was added to the cheese curd at the rate of 1 gm. per 100 lb. of milk. Approximately the same degree of flavor development was secured in the treated cheese in 5 mo. as was obtained in 12 mo. in normal cheese. The steapsin cheese was accepted by the trade, but was scored by competent judges as having a characteristic bitter flavor. Cheeses receiving steapsin but not inoculated with mold became rancid and developed none of the typical blue cheese flavor, showing that to obtain the characteristic flavor *Penicillium roqueforti* must be present and active.

Comparisons of the inactivation of phosphatase enzyme and the killing of Escherichia-Aerobacter organisms as criteria of satisfactory pasteuriza-

tion of ice cream mix, F. E. NELSON, W. J. CAULFIELD, and W. H. MARTIN. (Kans. Expt. Sta.). (*Jour. Dairy Sci., 22 (1939), No. 7, pp. 535–541*).—Continuing this line of investigation (E. S. R., 81, p. 569), it was found that in a typical ice cream mix the milk enzyme phosphatase was more resistant to heat than the more heat-resistant strains of bacteria in the *Escherichia-Aerobacter* group. It is concluded that the presence of *Escherichia-Aerobacter* organisms in the ice cream mix or in ice cream which is negative to the phosphatase test is indicative of contamination during or following pasteurization.

Controlling oxidized flavors, A. C. MAACK and P. H. TRACY. (Univ. Ill.). (*Ice Cream Trade Jour., 35 (1939), No. 3, pp. 32, 34*).—A further report of research previously noted (E. S. R., 79, p. 102).

VETERINARY MEDICINE

[Diseases of farm animals in Mississippi] (*Miss. Farm Res.* [*Mississippi Sta.*], *1 (1938), No. 3, p. 8; 2 (1939), No. 4, pp. 7, 8*).—Brief articles are included as follows: Vol. 1, No. 3, Blackhead Loss in Turkeys Prevented by Tobacco Dust in Ration, by G. R. Sipe; Vol. 2, No. 4, For Protection Against Chicken Pox Vaccinate Chicks Early, by G. R. Sipe, and Stomach Worms, the Most Serious Menace to Southern Sheep, Yield to Treatment With Copper Sulphate, by H. H. Leveck.

[Work with animal diseases by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [*1938*], *pp. 57–60*).—The work reported upon (E. S. R., 79, p. 535) relates to infectious coryza, with reference to studies of *Hemophilus gallinarum* and *H. influenzae*; infectious bronchitis; the use of iodine in treating gapeworm infection of pheasants; and autopsy examinations for the determination of diseases in fowls.

[Contributions on animal pathology and bacteriology] (*Jour. Bact., 38 (1939), No. 1, pp. 109, 112, 113, 114*).—Among the abstracts of contributions presented at the meeting of local branches of the Society of American Bacteriologists in May 1939 are: Studies on a Presumably Nonpathogenic, Acid-fast Microorganism Frequently Present in the Tonsillar Tissue of Swine, by A. G. Karlson and W. H. Feldman (p. 109); and Modification of Distemper Virus by Animal Passage, by R. G. Green (p. 112), Natural Distemper in Grey Foxes, by C. A. Evans and R. G. Green (p. 113), and Nonfatal Infections with *Pasteurella tularensis* in the Snowshoe Hare, by J. F. Bell and R. G. Green (p. 114) (all Univ. Minn.).

[Contributions on animal parasitology] (In *Raboty po gel'mintologii* (*Papers on helminthology*), edited by R. É. S SHUL'TS (SCHULZ) and M. P. GNEDINOÏ (GNYEDINA). *Moskva: All-Union Lenin Acad. Agr. Sci., 1937, pp. 5–8, 23–44, 55–65, 69–80, 89–104, 126–128, 155–179, 183–214, 226–230, 245–252, 296–304, 328–347, 388–402, 408–411, 418–428, 433–439, 454–462, 467–482, 491–504, 508–541, 550–564, 586–609, 615–636, 640–662, 713–724, 734–743, 758–762, 792–794, figs. 165*).—Among the contributions (for the most part in Russian) in this volume, published in commemoration of the thirtieth anniversary of the work of K. I. Skrîabina (K. J. Skrjabin) and the fifteenth anniversary of the All-Union Institute of Helminthology, are the following: On the Nutrition of the Nematode *Ascaridia lineata* (Schneider), by J. E. Ackert (pp. 5–8) (Kans. Expt. Sta.); A Comparison of the Anthelmintic Efficacy of Tetrachlorethylene and the "Sprehn-Capsules" Against Ascaridosis and Uncinariosis of Silver Foxes, by D. N. Antipin (pp. 23–28, Eng. abs. pp. 27, 28); Some Drugs Used in the Control of Ascarids in Pigeons [trans. title], by E. A. R. F. Baudet (pp. 29–36, Russ. abs. pp. 35, 36); Pathologic Anatomy and Pathogenesis of Dictyocaulosis of the

Horse, by G. I͡A. (G. J.) Belkin (pp. 37–44); The Nematodes of the Genus *Synthetocaulus* Parasitic in Sheep of Alma-Ata Territory, Kazakhstan, by S. N. Boev (Boyev) (pp. 55–62); *Echinoparyphium syrdariense* [n. sp.], a New Trematode of the Fowl, by T. E. Burdelev (pp. 63–65); A Revised Classification of the Nematoda, by B. G. Chitwood (pp. 69–80, Russ. abs. p. 80), A Review of the Genus *Oxyspirura*, With a Morphological Study of *O. petrowi* Skrjabin 1929, Recently Discovered in Galliform Birds of the Northern United States, by E. B. Cram (pp. 89–98, Russ. abs. p. 98), Observations on the Biological and Morphological Relationships of *Dispharynx spiralis* in Bird Hosts, by E. Cuvillier (pp. 99–104, Russ. abs. p. 104), and *Protostrongylus rushi*, a New Lungworm From the Mountain Sheep (*Ovis canadensis*), by G. Dikmans (pp. 126–128, Russ. abs. p. 128) (all U. S. D. A.); The Control of Strongyloidosis of Cattle, Sheep, Pig, and Horse, by V. S. Ershov (Ershoff) (pp. 155–159); The Life Cycle of *Strongyloides*, by E. C. Faust (pp. 160–166, Russ. abs. pp. 165, 166); Helminthofauna of Geese and Ducks in Western Siberia in Connection With the Problem of Natural Reservoirs for the Purpose of Bird Breeding, by A. V. Fediûshin (Fedyushin) (pp. 167–177); Parasitic Worms of the Horses of Azerbaijan, by A. D. Gaibov (pp. 178, 179); Methods of Isolating the Eggs and Larvae of Helminths From the Grass of the Pastures, by M. P. Gnedina (pp. 183–188); Some Remarks on Suitable Terms to Describe Nematodes or Other Animals Which Feed on Decomposing Organic Matter, by T. Goodey (pp. 189, 190); A Study of Helminthofauna of Domestic Geese of Omsk and Chelyabinsk Regions, by I. P. Gorshkov (pp. 191–202); A Comparison of Methods for the Detection of Eggs of Swine Metastrongyles, by O. K. Gorshunova (Gorschunova) (pp. 203–206); A Comparison of the Lung Lesions Produced in Laboratory Animals by *Ascaris lumbricoides* of Swine, by G. L. Graham (pp. 207–214, Russ. abs. p. 214); The International Control of Parasites, by M. C. Hall (pp. 226–230, Russ. abs. p. 230) (U. S. D. A.); A Study of the Anthelminthic Efficacy of Oil of Terebentine and Carbon Bisulphide Used Against Ascarides and Strongylids of Horses, by S. V. Ivanitskiĭ (Ivanitzky) and I͡A. G. (J. G.) Krasnov (pp. 245–252) Helminthofauna of Mongolian Sheep and Goats, by A. V. Kopyrin (pp. 296–301); A Study of Treatment of the Dictyocaulosis of Horses, by N. S. Kulikov and I. B. (J. B.) Tamarin (pp. 302–304); On the Distribution of the Encysted Stage of Certain Cestodes, by E. Linton (pp. 328–332, Russ. abs. p. 332) (Univ. Pa.); Parafilariosis of Horses in the Territories of the Lower Volga, by L. A. Losev (Lossev), I. P. Erokhin, and A. F. Nikanorov (pp. 333–345); An Attempt of Treating the Crenosomatosis of Silver Foxes, by A. P. Liûbimova (Lubimova) (pp. 346, 347); Anatomy and Morphology of the Strongyloides-Species of Domestic Animals, by S. A. Malygin (Maliguin) (pp. 388–395); A Method for Calculating the Eggs Contained in the Body of Helminths, by O. I͡A Miret͡skiĭ (O. J. Miretsky) (pp. 396, 397); Sparrows as Agent Distributing Helminthic Infections Among Domestic Animals, by A. A. Mozgovoĭ (Mosgovoy) (pp. 398–402); Helminths of Horses Found in the Voronezh Region, by B. Moskalev (Moskaleff) (pp. 408–411); A Study of the Biology of *Moniezia expansa*, by N. S. Murashkint͡sev and I. I. (J. J.) Malevich (pp. 418–426); On the Resistance of Larval Echinococci Against Some Physical and Chemical Agents, by A. F. Nosik (Nossik) (pp. 427, 428); Methods of Vital Differential Diagnosis of Infestation of Ruminants by Strongylata, by I. V. Orlov (Orloff) (pp. 433–439); The Helminthofauna of Domestic Animals of Mordovian Autonomous Kuibyshev, and Orenburg Districts, by M. A. Palimpsestov (pp. 454–458); Tapeworms of Sheep in Leningrad Region, by L. G. (L. S.) Panova (pp. 459–462); The Treatment of Dictyocaulosis of Sheep, by A. I͡A. (A. J.) Pervakov (pp. 467, 468); A Synopsis of the Helminth Parasites of Domestic Animals of Brazil (trans.

title], by C. Pinto and J. Lins de Almeida (pp. 469–482, Russ. abs. p. 482); *The Interrelation Between the Infestation by Ascarids and Bacterial Infections in Experimental Conditions*, by V. P. Pod''ıapol'skaıa (Podyapolskaya) and N. P. Dedova (pp. 491–496); A New Nematode of Cattle, ***Ostertagia kolchida*** n. sp., by Z. G. Popova (pp. 497–499); A New Trematode Species, ***Paramphistomum (Cauliorchis) skrjabini*** From the Rumen of Cattle and Buffaloes, by K. A. Popova (pp. 500–504); Vital Differential Diagnosis of Horse Strongylosis, Delafondiosis, Alfortiosis, Triodontophorosis, and Trichonematosis, by A. M. Petrov and V. G. Gagarin (pp. 508–528); The Diagnosis and Treatment of Hymenolepidosis (*Hymenolepis lanceolata*) of Geese, by V. A. Potemkina (pp. 529–541); Trichostrongylids From Abomasum of Reindeers, by E. P. Pushmenkov (pp. 550–559); Experiments of Destroying the Eggs of Hookworms and Ascarids of Dogs in the Soil, by Z. A. Raevskaıa (Rayevskaya) (pp. 560–564); Muscle-Coenurosis of Sheep in Uzbekistan, by L. P. Shibaev (p. 586); The Action of the Albuminous and Lipoidal Substances of Broad Tapeworm on the Blood of Experimental Animals, by N. P. Shikhobalova and N. V. Popova (pp. 587–606); On the Helminthofauna of Sheep in Georgia, by G. N. Shishkin (pp. 607–609); The Metastrongyles of Swine, Their Morphology, and Systematic Position, by R. É. S. Shul'ts (Schulz) and F. O. Kaminskii (Kaminsky) (pp. 615–624); Experiments on the Treatment of Trichostrongylidosis of Sheep and Goat, by E. E. Shumakovich (pp. 625–636); The Course of Infection of Pigs With Lungworms of the Genera ***Metastrongylus*** and ***Choerostrongylus***, by B. Schwartz and J. T. Lucker (pp. 640–652, Russ. abs. pp. 651, 652) (U. S. D. A.); Some Observations on the Biology of the Nematode ***Habronema megastoma*** (Rud. 1819), by A. A. Skvorts͡ov (Skvortzoff) (pp. 653–662); Helminthofauna of the ***Rangifer tarandus*** on the Kola-Peninsula, by B. A. Takhistov (pp. 713–716); The Influence of the Helminthological Factor on the Blood-Picture of Horses, by R. S. Chebotarev (pp. 717–719); A Study of the Efficacy of Natrium Santoninicum Against Ascarids of Pigs When Applied Subcutaneously, by I. A. (J. A.) Shcherbovich (pp. 720–724); The Treatment of Enterobiosis by Carbon Tetrachloride, by S. M. Tuaev (Tuaeff) (p. 734); ***Diorchis skrjabini*** n. sp., a New Cestode Parasite of ***Anas circia*** L., by A. N. Udint͡sev (Udintzev) (pp. 735–738); Developmental Stages in Acanthocephalan Life Histories, by H. J. Van Cleave (pp. 739–743, Russ. abs. p. 743) (Univ. Ill.); Pathological Changes of the Pancreas of Sheep Infested by ***Eurytrema pancreaticum***, by B. P. Vsevolodov (pp. 758–762); and On the Epizootology of Moniezlosis of Sheep, by G. A. Zakharevich (pp. 792–794).

[Contributions on animal pathology and parasitology] (*Indian Sci. Cong. Proc. [Hyderabad], 24 (1937), pp. 387, 388, 389, 392, 393, 394, 395, 396–398, 399*).— Among the contributions presented are: A Preliminary Investigation Into the Incidence of Enterotoxaemia Among Sheep in the Madras Presidency, by G. R. Viswanathan (pp. 387, 388); Two Unrecognized Forms of Lymphangitis in Horses, by S. C. A. Datta (pp. 388, 389); Urinary Calculus in the Rabbit, by M. Y. Mangrulkar (p. 389); Dissemination of Anthrax Infection Through Dirty Stagnant Pools and Contagious Bovine Abortion in India and Its Significance to Public Health, both by R. N. Naik (p. 392); Two Cases of Natural Acquired Tuberculous Infection in Cows in India Caused by the Human Tubercle Bacillus (pp. 392, 393) and Prevalence of Tuberculosis Among Animals Other Than Domestic Cattle in India (p. 393), both by M. B. Soparkar; Mange Affecting the Horn of Buffaloes and Coccidiosis in Crows, both by R. N. Naik (p. 394); Field Investigation of the Problem of Liver Fluke Infestation Amongst Cattle and Sheep in Hyderabad State, by M. R. Mahajan (p. 394); The Occurrence of Spinose Ear Tick (***Ornithodorus megnini***) in India, by S. K. Sen (pp. 394, 395);

Experiments on the Transmission of Rinderpest Through the Agency of *Stomoxys calcitrans*, by S. K. Sen and A. Salam (p. 395); and A Study of the Life-History of *Cotylophoron cotylophorum* (Fischoeder 1901) Stiles and Goldberger 1910 of Indian Ruminants and a Biological Control to Check the Infection (p. 396), A Study of the Life-History of a Common Tapeworm, *Mesocestoides lineatus*, of Indian Dogs and Cats (pp. 396, 397), Studies on the Helminth Parasites of Indian Poultry—I, A New Fluke From the Oviduct of Fowl (p. 397), II, The Occurrence of Gape-Worms in Fowls (p. 397), and III, The Occurrence of Two Spirurid Stomach-Worms in Fowls (p. 398), A Few Species of Anoplocephalid Tapeworm of the Genus *Bertiella* From a Domestic Pigeon (p. 398), and The Occurrence of an Unrecorded Filarid Nematode, *Onchocerca cervicalis* Railliet and Henry 1910 in the Ligamentum Nuchae of Horses in India (p. 399), all by H. D. Srivastava.

[Contributions on animal pathology and parasitology] (*Indian Sci. Cong. Proc. [Calcutta], 25 (1938), pt. 3, pp. 259–261, 262–266, 268–271, 272, 273, 275*).—*Among the contributions presented at the twenty-fifth Indian Science Congress* held in January 1938 are the following: Observations on Bartonellosis in Dogs, by H. N. Ray and J. A. Idnani (p. 259); The Occurrence of Air-Sac Mite, *Cytoleichus nudus* (Vizioli 1870), in Fowls in India, by R. L. Kaura and S. G. Iyer (pp. 259, 260); A Form of Verminous Ophthalmia in Equines, by P. R. K. Iyer (p. 260); Cutaneous Microfilariasis in Indian Cattle (pp. 260, 261), Stomach Worms in the Indian Domestic Ducks (p. 261), Occurrence of Whipworms and Bloodflukes in Indian Dogs (p. 261), Some Unrecorded Helminths From Indian Ducks and Geese (p. 261), and Verminous Pneumonia in Indian Buffaloes (pp. 262, 263), all by H. D. Srivastava; Surra in Hyderabad State, by M. R. Mahajan (p. 263); Rhinosporidiosis in Bovines in the Madras Presidency, With a Discussion on the Probable Modes of Infection, by M. A. Rao (pp. 263, 264); Rhinosporidiosis in Equines: Record of Another Case in India, by L. Sahai (p. 264); Experiments on the Transmission of Surra (*Trypanosoma evansi* Infection) Through the Agency of *Ornithodorus papillipes* Birula, With Remarks Upon the Bionomics of This Tick, by S. K. Sen (pp. 264, 265); On the Nuclear Structure of *Babesia bigemina* (Smith and Kilbourne), by H. N. Ray (p. 265); Observations on the Forms of *Babesia gibsoni* (Patton) in Dogs, by H. N. Ray and J. A. Idnani (p. 265); On the Occurrence of *Babesia bovis* Starcovici 1893, by J. A. Idnani (p. 265); Bovine Theileriasis—Preliminary Report, by S. C. A. Datta (p. 266); An Outbreak of Equine Encephalomyelitis in a Mounted Military Police Troop in Bihar—A Preliminary Report, by L. Sahai (p. 268); The Incidence of *Salmonella enteritidis* var. *dublin* in Pyosepticaemia of Calves in India, by V. R. Rajagopalan (p. 268); The Incidence of *Corynebacterium equi* in a Buffalo-Cow, by V. R. Rajagopalan and V. R. Gopalakrishnan (p. 268); Neurolymphomatosis in Poultry (pp. 268, 269), Diseases of the Egg-Laying Apparatus of the Hen (p. 269), Leg Weakness in Poultry (p. 269), and Some Common Poultry Ailments Encountered in the Mysore State (p. 269), all by P. M. N. Naidu; A Controlled Epidemic in Guinea-Pig Colony, by K. D. Manohar (pp. 269, 270); A Preliminary Report on the Viability of *Mycobacterium paratuberculosis enteritis* Under Conditions Simulating Those in the Field, by P. C. Banerji and K. Raghavachari (p. 270); Cysteine Hydrochloride As a Suitable Reducing Agent in Glucose Broth for Obtaining Cultures of *Clostridium chauvei* for the Routine Production of Blackquarter Vaccine, by V. R. Rajagopalan (pp. 270, 271); Studies on a Natural Outbreak of Pigeon Pox, by R. L. Kaura and S. G. Iyer (p. 271); Actinomycosis and Actinobacillosis in Animals in India, and Melanomata in Domesticated Animals, both by M. Y. Mangrulkar (p. 271); Changes in Phosphorus and Calcium Content of Blood During Rinderpest Syn-

drome in Hill Bulls, by R. L. Kaura (p. 272); Heminth Parasites of Dogs—Their Treatment and Control (pp. 272, 273) and Verminous Pneumonia in Domestic Animals—Its Control and Treatment (p. 272), both by H. D. Srivastava; and Is Lifelong Immunity Against Rinderpest Conferable on Bovines? by P. C. Banerji (p. 275).

Textbook of comparative physiology, C. G. Rogers (*New York and London: McGraw-Hill Book Co., 1938, 2. ed., XVIII+715, [pl. 1], figs. [157]; rev. in Ann. Ent. Soc. Amer., 31 (1938), No. 4, p. 444*).—A new edition (E. S. R., 56, p. 774).

Poisonous plants and livestock poisoning, O. A. Beath, H. F. Eppson, C. S. Gilbert, and W. B. Bradley (*Wyoming Sta. Bul. 231 (1939), pp. 104, figs. 64*).—Following a general discussion this practical account deals with (1) plants in which the toxic minerals do not seem to be of special significance (pp. 16–55), (2) plants in which the poisonous properties are influenced by the content of toxic minerals (pp. 56–95), (3) poisonous plants of minor importance (pp. 96–100), and (4) mineral malnutrition (pp. 101, 102). Accounts of the several plants considered, in addition to other data, include place of growth, occurrence, animals affected, poisonous period, symptoms, and treatment.

Goblet cells and age resistance of animals to parasitism, J. E. Ackert, S. A. Edgar, and L. P. Frick. (Kans. Expt. Sta.). (*Amer. Micros. Soc. Trans., 58 (1939), No. 1, pp. 81–89, figs. 4*).—Included in this contribution is evidence that older chickens and older rats have larger numbers of duodenal goblet cells than do younger chickens and rats. "By growing young intestinal nematodes (*Ascaridia lineata* (Schneider)) in artificial culture media into which mucus from the duodenal goblet cells from resistant chickens was introduced, evidence has been obtained which indicates that the duodenal mucus contains an inhibitory factor for growth of the young *A. lineata*." A list of 19 references to the literature is included.

Contribution to our knowledge of parasites in domestic and wild animals in Sweden [trans. title], M. Koffman (*Skand. Vet. Tidskr., 29 (1939), No. 5, pp. 509–585, figs. 64; Eng. abs., p. 585*).—Parasites of the fowl, fox, cat, dog, nutria, rabbit, hare, and guinea pig in Sweden are described.

Bacterial chemotherapy: The pharmacology of sulfanilamide, E. K. Marshall, Jr. (*Physiol. Rev., 19 (1939), No. 2, pp. 240–269*).—This discussion is accompanied by a list of 179 references to the literature.

Investigations on the sterilization efficacy of gaseous formaldehyde, G. Nordgren (*Acta Pathol. et Microbiol. Scand., Sup. 40 (1939), pp. IX+165, figs. 12*).—This is a report of investigations of formaldehyde sterilization with regard not only to the bacteriological but also to the physicochemical and practical technical factors. A bibliography of 12 pages is included.

The use of sulfoleum in the treatment of nonparasitic skin diseases, M. W. Emmel. (Fla. Expt. Sta.). (*North Amer. Vet., 20 (1939), No. 6, pp. 33, 34*).—The use of sulfoleum, a mixture of a light petroleum oil fraction with a vegetable oil admixture and a pentasulfide, has been found of value in the treatment of canker of the ears of mules, rabbits, and dogs.

The preparation of a relatively stable urease concentrate from blowfly [Lucilia sericata] larvae, F. C. Baker (*Jour. Parasitol., 25 (1939), No. 3, p. 280*).—Description is given of a method found to be fairly satisfactory in the removal of a urease ferment from the living blowfly and its preservation without a rather prompt and severe loss of activity.

The use of sulphanilamide in anthrax, C. A. Mitchell, R. V. L. Walker, and D. G. McKercher (*Canad. Jour. Compar. Med., 3 (1939), No. 5, pp. 119–130, figs. 10*).—Guinea pigs were found to be very susceptible to sulfanilamide and when given in sufficient quantities to maintain a fair amount of free drug in

the blood stream they succumbed to its toxic action. They did, however, live long enough to demonstrate, in the majority of animals inoculated, that anthrax infection was controlled temporarily by its use. "It would seem likely, having regard to the ratio between free sulfanilamide in the blood and its toxicity for guinea pigs, that sulfanilamide should control anthrax in other species of animals where a satisfactory blood level may be maintained."

Three cases of cerebellar agenesia, L. B. SHOLL, E. K. SALES, and R. LANGHAM. (Mich. Expt. Sta.) (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 229, 230, figs. 3*).

The present position regarding Listerella monocytogenes infection in animals and man, J. S. PATERSON (*Vet. Rec., 51 (1939), No. 28, pp. 873–876*).—This account is presented with a list of 28 references to the literature.

Mal-de-caderas in Venezuela (synonym derrengadera), E. MORGAN (*Vet. Jour., 95 (1939), No. 5, pp. 178, 179*).

Water-borne outbreak of Brucella melitensis infection, A. W. NEWITT, T. M. KOPPA, and D. W. GUDAKUNST (*Amer. Jour. Pub. Health, 29 (1939), No. 7, pp. 739–743, figs. 3*).—Report is made of an outbreak of 80 cases of *B. melitensis* infection at East Lansing, Mich., which resulted in 1 death. "All cases occurred in students and others using a bacteriology building which contains a laboratory that handled large numbers of *Brucella* cultures. A faulty technic of sterilization of discarded cultures was demonstrated. Inadequate and faulty plumbing was found in which siphonage could be produced from the point where contaminated glassware was washed."

A preliminary report of the blood picture in brucellosis, M. MUNGER and I. F. HUDDLESON. (Mich. Expt. Sta.). (*Jour. Lab. and Clin. Med., 24 (1939), No. 6, pp 617–619*).—In a study of *Brucella melitensis*-infected individuals the blood picture revealed a leucopenia with a relative lymphocytosis and monocytosis. "The red blood cells tend to be slightly smaller than normal; however, some patients gave evidence of macrocytosis. The presence of 'pathologic lymphocytes' in 40 percent of the brucellosis cases is significant. 'Liver damage cells' were found consistently in these patients. Finally the basophilia of the granules of the neutrophiles seems to differentiate the *B. melitensis* infection from that of the [*B.*] *suis* and the [*B.*] *abortus* infection."

The classification of the streptococci of bovine mastitis [trans. title], R. B. LITTLE and F. C. MINETT (*Skand. Vet. Tidskr., 29 (1939), No. 5. pp. 586–588; Eng. abs., pp. 587, 588*).

The rapid identification of Streptococcus agalactiae, A. H. BRUECKNER and S. E. HARTSELL. (Purdue Univ.) (*Ind. Acad. Sci. Proc., 54 (1938), pp. 35–43*).—In work reported an attempt to adapt Neufeld's capsule swelling to group B streptococci failed for lack of a method "of rapidly inducing consistent capsule formation in the species tested. A rapid microscopic agglutination test for group B streptococci is presented. The test has shown close correlation with biochemical tests for the identification of *S. agalactiae*. The test was successful in identifying 98 percent of the freshly isolated strains of this micro-organism. This efficiency is attributed to the methods employed in obviating the difficulties of spontaneous agglutination which are inherent in cultures of streptococci. There is a suggestion that data assembled by the use of the microscopic agglutination test is in accordance with the conclusions of Stableforth [E. S. R., 68, p. 671] in his work on the etiology of mastitis." There are 12 references to the literature.

Second report on the use of large doses of sulfanilamide in the treatment of chronic streptococcal mastitis, W. T. MILLER, F. M. MURDOCK, and J. O. HEISHMAN. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749,*

pp. 140–145).—In continuation of the earlier work (E. S. R., 81, p. 108), "three lactating cows were treated for a period of 6 days with large doses of sulfanilamide in an attempt to cure chronic streptococcal mastitis. A fourth cow which was included in the group died during the course of treatment. The animal was found to be infected with Johne's disease. Although the streptococci were not permanently removed from the udders of these cows, there was a temporary removal of these organisms from the milk. Each cow received 0.4 gm. of sulfanilamide per kilogram of body weight as the initial dose and 0.2 gm. every 12 hr. for six doses. The amount was then reduced to 0.15 gm. for two doses and to about 0.1 gm. for the three remaining doses. This scaling down of the drug became necessary because of a tendency for the sulfanilamide to accumulate in the blood and milk. This dosage produced a concentration of 20 mg. in 100 cc. and above in the blood and milk which was maintained for 6 days. The three cows which remained in the experiment showed little ill effect from the treatment except for a temporary decrease in milk production and some loss in weight."

Toxicity, therapeutic activity, and mode of action of sulfanilamide in experimental streptococcus infections of rabbits, J. A. Kolmer, H. Brown, and A. M. Rule, with assistance of M. F. Werner (*Jour. Lab. and Clin. Med., 24 (1938), No. 2, pp. 164–177*).—A report on an investigation confined to the study of sulfanilamide in the treatment of experimental lesions.

The use of the incubating egg as a differential medium, H. J. Metzger, F. R. Beaudette, and F. R. Stokes. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, p. 158*).—The work conducted by the authors has led to the conclusion that incubating hens' eggs may offer a more economical and a faster medium for the study of the occurrence of *Brucella abortus* in milk.

Rocky Mountain spotted fever: Protective value for guinea pigs of vaccine prepared from rickettsiae cultivated in embryonic chick tissues, H. R. Cox (*Pub. Health Rpts. [U. S.], 54 (1939), No. 24, pp. 1070–1077*).—It has been found that vaccine which will protect guinea pigs against Rocky Mountain spotted fever can be prepared from infected embryonic tissues of developing chicks.

Sylvatic plague: Studies of predatory and scavenger birds in relation to its epidemiology, W. L. Jellison (*Pub. Health Rpts. [U. S.], 54 (1939), No. 19, pp. 792–798*).—Report is made of field and laboratory observations on the possible relationship of flesh-eating birds to the epidemiology of sylvatic plague in a plague epizootic area in southwestern Montana. It was found that predatory species, especially, transport flea-infested rodents and serve as accidental hosts of rodent fleas. The abundance and variety of rodent fleas found in the nest of a burrowing owl suggest that this species may prove of particular importance. "Casts from predatory birds fed plague-infected guinea pig tissue were consistently infectious. Infection was not demonstrated in two instances in which portions of a plague-infected ground squirrel found dead in nature were used for the infective feedings. Tests on the infectivity of feces of birds being fed plague tissue were consistently negative but were restricted to a few species."

Resistance of the larvae of the common dog tick and their behavior on the human skin, Z. de Jesus (*Philippine Jour. Anim. Indus., 6 (1939), No. 1, pp. 55–60*).—A brief account of the brown dog tick, the larvae of which do not attach to the skin of human beings. It is shown that spraying with a liberal amount of a 1-percent solution of lysol or creolin or flushing with hot water will kill most of the larvae which are in the crevices of the floors and walls.

Mice as carriers of pathogenic pleuropneumonia-like microorganisms, A. B. Sabin (*Science, 90 (1939); No. 2323, pp. 18, 19*).—The author's studies indicate that the presence or absence of pathogenic pleuropneumonia-like micro-organisms in rheumatic fever and rheumatoid arthritis exudates and tissues will have to be established primarily by cultural methods and not by passage through mice or other animals that may be carriers of similar micro-organisms.

Maintenance of echinococcus in the United States, W. A. Riley. (Univ. Minn.) (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 170–172*).—The author is led to conclude that in the United States the maintenance of hydatid infection in domesticated as well as in wild mammals is due to the fact that wolves play the role of primary hosts.

Sources of error in the agglutination test for Bang's disease, C. R. Donham. (Ohio State Univ.) (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 136–139*).

Results of administering sulfanilamide for the treatment of bovine mastitis.—Preliminary report, W. G. Stevenson (*Canad. Jour. Compar. Med., 3 (1939), No. 6, pp. 147–155, 158–160*).—In the experiments conducted, the details of which are given in 9 tables, 10 animals known to be harboring streptococci in their udders were each given 648 gm. of sulfanilamide in 8 days. "This dosage of sulfanilamide was incapable of eliminating streptococci from the udder. The dosage employed had very little effect on the appetite, temperature, or amount of milk secreted. The failure of sulfanilamide in the dosage employed to prove of value in the treatment of bovine mastitis may be due to the fact that the temperature was not elevated. It has been pointed out that sulfanilamide at 40° C. possesses bacterial properties, while at 37° it possesses but bacteriostatic properties. Thus, although negative results were obtained in this experiment, had the temperature of the animals been 103° F. or higher, rather than 100.8°, the drug might have proved more efficacious. The sulfanilamide content of the milk from the four quarters of each animal was remarkably similar, not more than 0.2 mg. per 100 cc. difference being noted. The appetite, period of gestation, and clinical symptoms appeared to have no influence on the concentration of sulfanilamide in the blood or milk. The amount of milk secreted per day by an animal appeared to have a slight effect on determining the amount of sulfanilamide in it and in the blood. However, the method of handling the blood and milk collection and the small number of animals prohibit drawing definite conclusions. Three samples of blood tested for sulfanilamide content and stored at ice box temperature for 7 days showed an average decrease of 28.1 percent in sulfanilamide content. Sulfanilamide in the dosage employed in this experiment had no effect on the agglutination titer for brucellosis." A list is given of 33 literature references.

A report on the Hotis test, V. D. Foltz. (Kans. State Col.). (*Jour. Bact., 38 (1939), No. 2, pp. 233, 234*).—Studies are reported which revealed the Hotis test (E. S. R., 76, p. 391) to be in agreement with the microscopic examination in 97.6 percent of all tests conducted in the course of routine control of mastitis in the dairy herd at the Kansas State College. In the study of the group of cows that were supposedly positive for mastitis, in which the leucocyte counts of the milk from one or more quarters were usually, though not necessarily, above 500,000 per milliliter and which furnished 1,167 of the 7,640 quarters examined, a positive Hotis test was given in but 84.3 percent of those samples exhibiting long-chained streptococci on incubation. On the other hand, only 89.1 percent of the samples which were negative on incubated samples were likewise negative for the Hotis test. It is concluded that, despite these

errors, the Hotis test appears to be the most satisfactory that has been developed to date for the field diagnosis of steptococcus mastitis.

Trichomoniasis in cattle: Biological studies and a system of control, W. M. Swangard. (Wash. State Col.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 146–151*).—The author finds trichomoniasis to be a sexual disease in cattle transmitted only by coitus, and that the causative organism, *Trichomonas bovis*, does not enter the circulatory system of either sex or the urogenital tract of males. The symptoms have been found to vary greatly, and diagnosis must rely on history and microscopy where symptoms are absent. The findings have shown that the disease may be eliminated by proper treatment.

The rôle of the avian tubercle bacillus in the sensitization of cattle to tuberculin, W. H. Feldman (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 152–157*).—A summary of findings reviewed as to the ability of the avian tubercle bacillus to infect cattle and to sensitize bovine animals to tuberculin has led to the conclusion that the avian tubercle bacillus has a limited pathogenicity for cattle. "When lesions occur they are in the majority of instances small, localized, and nonprogressive. Instances in which the disease was generalized have not been reported. Under conditions of natural exposure the lymph nodes of the alimentary canal are the sites of predilection for the avian type of infection in cattle. Lymph nodes that appear grossly to be without morbid changes may, by suitable laboratory procedures, yield avian tubercle bacilli. Following natural or experimental exposure to avian tubercle bacilli, most cattle develop sensitivity to avian tuberculin. In cases of natural exposure this sensitivity is usually transitory and eventually disappears if the animals are moved to a noninfected environment. Occasionally, cattle sensitized under natural conditions will react rather typically to mammalian tuberculin. Plum's observations [E. S. R., 78, p. 852] suggest that a definite reaction, but of substandard dimensions, occurs in the majority of cattle that harbor avian tubercle bacilli. It seems not unlikely that in the United States the avian tubercle bacillus sensitizes more cattle to mammalian tuberculin than is generally recognized, and the possibility is suggested that at least some of the so-called nonvisible lesion reactors react to mammalian tuberculin as a consequence of sensitivity induced by avian tubercle bacilli. In areas where tuberculosis of fowl is prevalent and the infective agent exists in excessive concentration, sensitivity due to the avian tubercle bacillus should be seriously considered in reacting cattle from herds in which it is reasonably certain that infection with bovine tubercle bacilli has not occurred."

Colon group bacteria as the cause of acute fatal dysentery in new born calves, J. W. Dollahite. (U. S. D. A.). (*Jour. Bact., 38 (1939), No. 1, p. 119*).—This is an abstract of a contribution which reports on severe losses from dysentery in newborn calves that have occurred over a period of at least 12 yr. in a Government-owned institutional dairy of about 250 animals. "During the first 5.5 mo. of 1938, 49 percent of the newborn calves died with acute dysentery before they were 5 days old. Cultures of *Escherichia communior* and *E. acidilactici* were recovered from a large percentage of these calves that came to autopsy. A normal cow was hyperimmunized against these two cultures of bacteria and an immune serum prepared. Between June 15, 1938, and March 1, 1939, 58 calves were treated with this serum. Of this total treated, 4 calves or 6.9 percent died with dysentery. During the same period 65 calves were left untreated as controls. Fifteen control calves or 23.1 percent died with acute dysentery. Colon-group bacteria were recovered from about 60 percent of these calves that were autopsied."

Toxicity of the coffee bean (Sesbania vesicaria) for sheep, I. B. Boughton and W. T. Hardy. (Tex. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 239–241*).—Brief report is made of an outbreak of fatal poisoning caused in a farm flock of sheep by eating of ripe seeds of the coffee bean plant (*S. vesicaria*) in February 1939. While the minimum lethal dose of seed was not determined definitely, tests indicate that it lies somewhere between 0.0625 and 0.03125 percent of the body weight. Three mature sheep were fatally poisoned by feeding them 0.25, 0.125, and 0.0625 percent of their body weights, respectively, and two yearling lambs, consuming 0.03125 and 0.0156 percent of their body weights, respectively, were severely poisoned but gradually recovered within 16 days.

In a botanical description of *S. vesicaria*, by L. V. Cory, which is incorporated, reference is also made to other species of *Sesbania* that occur in Texas.

Infectious entero-toxemia of lambs, I. B. Boughton. (Tex. Expt. Sta.). (*Tex. Agr. Workers' Assoc. Mtg., Papers, 1939, pp. [105–109]*).

Anthelmintic efficiency against immature Haemonchus contortus, H. McL. Gordon (*Austral. Vet. Jour., 15 (1939), No. 2, pp. 57–68, figs. 2*).—The results of experiments reported show that the administration of anthelmintic is not as effective against immature as against mature stomach wireworms. "Mixtures of copper sulfate with sodium arsenite and copper sulfate with nicotine sulfate are more efficient than carbon tetrachloride against immature *H. contortus*. Copper sulfate solution appears to be very inefficient. As a result of the general inefficiency of treatment against immature *H. contortus*, treatments must be repeated at about 10- to 14-day intervals during severe outbreaks of haemonchosis. Inefficiency of treatment against immature *H. contortus* offers an explanation for apparent failures of treatment in severe outbreaks of haemonchosis in the field, particularly in those instances in which the treated flock was not moved from infected pastures."

Studies on the bionomics of Trichostrongylus axei (Cobbold) and its seasonal incidence on irrigated pastures, M. A. Stewart and J. R. Douglas. (Univ. Calif.). (*Parasitology, 30 (1938), No. 4, pp. 477–490, figs. 2*).—It is pointed out that with the widespread adoption in California of ladino clover as a pasturage for sheep, especially for feeder lambs, the problem of controlling stomach worms has become increasingly important. Heavy infections of *T. axei* present a particularly acute clinical picture. Investigations reported upon in this contribution were carried on primarily for the purpose of determining the epidemiology of trichostrongylosis under conditions of irrigation. Details of the studies of the life history and bionomics of this parasite, commenced in August 1935, are reported upon. "A mixture of a 1-percent solution of 40 percent nicotine sulfate and 1 percent copper sulfate appears to be a more efficient anthelmintic against *T. axei* than a straight 1-percent copper sulfate solution. Changing from green feed to hay or rendering hay available along with green feed may possibly have a therapeutic effect. Spontaneous recovery, so far as clinical symptoms are concerned, from an acute trichostrongylosis, without the administration of a drug or changing the diet, seems to be common, if not the rule, in the majority of lambs in an infected band."

The effect of tobacco licks used for the prevention of trichostrongylosis in sheep, H. McL. Gordon (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 2, pp. 104–108*).—In experiments reported, a tobacco preparation containing about 10 percent nicotine, administered either in the form of a lick or by daily dosing with a spoon, did not check the development of trichostrongylosis. This is said to confirm earlier unpublished observations indicating that

tobacco preparations in lick form are of no value in the control of *Trichostrongylus* spp.

Studies on the course of trichostrongyle infestation in sheep, H. S. CAMERON and M. A. STEWART. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 177–180, figs. 2*).—Report is made of studies of the age susceptibility of the host, the daily fluctuation in egg count, and the duration of patency of the parasite, based upon egg counts. Lambs at 1 week of age were found susceptible to trichostrongyle infestation. "Resistance and susceptibility based on the fecal egg count are present not only at this age but at more advanced ages as well. There is no apparent difference in the degree of susceptibility between animals 1 mo. of age and those 1 yr. of age. There is a fluctuation in the egg count from day to day in untreated animals. In anthelmintic investigations where efficiency is based upon egg counts it is necessary to make such counts daily over a prolonged period of time. The duration of oviposition is at least 1 yr."

A case of sheep tuberculosis due to the bovine type, E. L. STUBBS and I. LIVE (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 173–176, figs. 2*).—Report is made of the occurrence of a case of tuberculosis in sheep due to the bovine type of the tubercle bacillus. It is pointed out that most of the cases of this disease in sheep thus far typed have been avian.

A case of severe taeniasis and haemonchosis in a young goat, P. S. MANGONON (*Philippine Jour. Anim. Indus., 6 (1939), No. 1, pp. 77–79*).—A case report of *Moniezia expansa* and *Haemonchus contortus* in a young goat.

Moose encephalitis, L. S. KING (*Amer. Jour. Pathol., 15 (1939), No. 4, pp. 445–454, pls. 2*).—A description of a subacute or chronic leucoencephalitis occurring naturally in moose, based upon cases in Maine, is presented. "The characteristic picture consists of a mild degree of perivascular demyelination, with formation of neutral fat, and with fibrous gliosis disproportionate in extent to the loss of myelin. There may be mild inflammation restricted to the white matter. There is suggestive evidence that a primary inflammatory reaction involving gray matter and observed in one animal out of eight may represent a separate condition. Attempted animal passage of fresh material from one case was unsuccessful. The etiology of this leucoencephalitis is obscure, although various possibilities are discussed." A list is given of 17 literature references.

Lesions of hog cholera: Their frequency of occurrence, H. C. H. KERNKAMP. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 159–166*).

Serological studies of swine influenza viruses, R. E. SHOPE (*Jour. Expt. Med., 69 (1939), No. 6, pp. 847–856, figs. 2*).—In further work with swine influenza viruses (E. S. R., 78, p. 538) cross-neutralization tests with serums from animals that had recovered from the affection indicated the serological identity of seven strains of virus obtained from different sources. "Cross-neutralization tests with serums from rabbits immunized to swine influenza virus exposed serological differences among the same seven swine influenza virus strains. Two strains appeared to be serologically similar and were characterized by the ability to produce effective homologous virus-neutralizing serums which were, however, poor or ineffective against the heterologous virus strains. Two other strains were also serologically similar but produced antibodies effective not only against themselves but against all heterologous strains as well. The remaining three strains were intermediate in their ability to produce heterologous virus-neutralizing antibodies.

"The human influenza viruses included, especially strains WS and Oakham, were most effectively differentiated serologically from the swine influenza

viruses by rabbit antiserums. The suggestion is advanced that swine antiserums express the antigenic composition of the swine influenza viruses, while rabbit antiserums reflect either their antigenic arrangement or the arrangement of the components responsible for their mouse pathogenicity. On this interpretation the seven strains of swine influenza virus studied would be considered to have similar antigenic compositions but differing antigenic structures. The serological differences among strains of the swine influenza virus, detectable by rabbit antiserums, are probably of no practical significance so far as the natural disease, swine influenza, is concerned."

A record of twelve outbreaks of paratyphoid disease in pigs in Northern Ireland, P. L. SHANKS (*Vet. Jour., 95 (1939), No. 5, pp. 180–185*).

Investigations of the piroplasmoses of swine [trans. title], C. G. CERRUTI (*Ann. Parasitol. Humaine et Compar., 17 (1939), No. 2, pp. 114–136, pls. 3, figs. 4*).—The author finds in work with *Piroplasma trautmanni* K. and d. T. and *Babesiella perroncitoi* n. sp., two forms indistinguishable clinically and anatomo-pathologically, that Acaprine (Bayer) possesses a therapeutic action that is specific for both. The report is presented with a list of 24 references to the literature.

The tick as a vector for the virus disease equine encephalomyelitis, J. T. SYVERTON and G. P. BERRY (*Jour. Bact., 33 (1937) No. 1, p. 60*).—This abstract of a report of work indicates that *Dermacentor andersoni* (Stiles) may serve as a natural vector in the dissemination of the western strain of the virus of equine encephalomyelitis. "Adult and nymph ticks were allowed to engorge on separate guinea pigs immediately after the pigs had been inoculated with brain tissue-equine encephalomyelitis virus suspension. At intervals of from 32 to 80 days thereafter, successive stages in the developmental cycle of the tick, larvae, nymphs, and adults were fed on different groups of normal gophers or guinea pigs. Infection resulted in these animals. Continuity of the virus through all of the stages in the developmental cycle of the tick, including survival through the egg stage, has been demonstrated. So far, this period of continuity has lasted for 130 days."

On the susceptibility of ground squirrels to the virus of equine encephalomyelitis and ticks as possible vectors, R. GWATKIN (*Canad. Jour. Compar. Med., 3 (1939), No. 5, pp. 131–133*).—In experiments in which 13 gray gophers (*Citellus richardsoni*) were injected by the intracerebral route with guinea pig brain suspension of equine encephalomyelitis, 9 died of encephalomyelitis in from 48 to 78 hr. after injection and 4 from other causes. Control guinea pigs died from 72 to 104 hr. after being inoculated. "The cause of death in the gophers was confirmed by the inoculation of guinea pigs with gopher brain suspensions and by the absence of bacteria on culture in all cases. The symptoms in gophers were less noticeable than in guinea pigs, as the former do not normally move around as much in their cages as the latter. A healthy gopher which harbored engorged nymphs of *Dermacentor andersoni* when captured was infected with guinea pig brain by the intracerebral route. After death of this gopher, blood was expressed from the ticks, and a suspension of this injected intracerebrally killed one guinea pig, while another was ill but survived. The survivor resisted a challenge inoculation of guinea pig brain 25 days after the first injection, while the control animal died."

The demonstration of phase variation in Salmonella abortus-equi, P. R. EDWARDS and D. W. BRUNER (Ky. Expt. Sta.). (*Jour. Bact., 38 (1939), No. 1, pp. 63–72, figs. 2*).—A study of the "supposedly monophasic *S. abortus equi* by the Wassén technic revealed that this organism contained three phases. Phase 1 is identical with the flocculating antigens of *S. paratyphi* A. Phase 2 is the form in which the species naturally occurs. Phase 3 is related to, but not

identical with, the beta phase of the Schleissheim type. The phases are reversible, and by use of suitable immune serums one phase may be changed to either of the others. This is the first instance in which more than two phases have been demonstrated in a *Salmonella*. It is also the first instance in which induced phases isolated from monophasic specific types have been proved to be reversible."

The use of Neo-Prontosil in strangles, K. L. Douglas and R. V. L. Walker (*Canad. Jour. Compar. Med., 3 (1939), No. 6, pp. 166–169*).—Work conducted during an outbreak of strangles among several horses in a cavalry depot is reported. When recognized in the early stages of the disease Neo-Prontosil controlled the infection, rapidly bringing about complete recovery and preventing the suppuration that usually occurs.

Studies upon Strongylus vulgaris, II–IV. (Kans. Expt. Sta. et al.). (*Amer. Jour. Hyg., 30 (1939), No. 1, Sect. D, pp. 1–27, figs. 5*).—In continuation of the studies of the most important parasite of horses in the Manhattan, Kans., area (E. S. R., 81, p. 717), part 2, by J. H. Whitlock, reports upon the Initial Development of Apparatus Adapted for the Study of *S. vulgaris* in vitro (pp. 1–3); part 3, by J. H. Whitlock, R. P. Link, and E. E. Leasure, on The Influence of Hydrogen-Ion Concentration Upon the Longevity of *S. vulgaris* in vitro (pp. 5–14); and part 4, by G. L. Graham, on the Seasonal Variation in the Production of Heterogonic Progeny by Singly Established *S. ratti* From a Homogonically Derived Line (pp. 15–27).

The simultaneous occurrence of the viruses of canine distemper and lymphocytic choriomeningitis, G. Dalldorf (*Jour. Expt. Med., 70 (1939), No. 1, pp. 19–27*).—In correcting an earlier contribution (E. S. R., 79, p. 250), an account is given of a particular strain of canine distemper, long maintained by serial passage in dogs and ferrets, which has been found to contain the virus of lymphocytic choriomeningitis in addition to that of distemper.

A note on the action of atropine in the bird, J. D. P. Graham (*Jour. Physiol., 93 (1938), No. 3, pp. 56P–58P, fig. 1*).—*The author has found from* experiments conducted with the duck that the effect of atropine on the bird is not identical with its effect on the mammal. "While the absence of pupillary dilatation is explained by differences in histological structure, the dissimilarity in regard to heart and respiration cannot be explained on this basis. The reaction of the gut to adrenaline is noted with interest."

Respiratory diseases [of poultry]: Their prevention and control, J. P. Delaplane (*Rhode Island Sta. Misc. Res. Pub. 4 (1939), pp. [1]+7+[1], fig. 1*).—A practical summary of information on respiratory diseases of poultry.

The status of Philippine avian pest in the past ten years, A. B. Coronel (*Philippine Jour. Anim. Indus., 6 (1939), No. 1, pp. 43–54, pl. 1, figs. 2*).—An account of avian pest, considered to be the most destructive disease of the avian family in the Philippines, where it has been established for 10 yr.

Fowl leukosis.—IV, Symptoms and pathology. V, Transmission experiments, C. D. Lee and H. L. Wilcke. (Iowa Expt. Sta.). (*Poultry Sci., 18 (1939), No. 3, pp. 244–254*).—A continuation of these studies (E. S. R., 79, pp. 251, 540; 81, p. 113).

In the conclusion drawn from this series of studies it is pointed out that the term fowl leucosis is used to include the group of transmissible leukemic, aleukemic, and leukemiclike diseases of fowls. "The disease in all expressions may be transmitted to healthy chicks by injection of tissue suspensions of affected organs, by injection of cell-free filtrates, by pen contact exposure, or by contact with contaminated soil or litter. The evidence indicates that fowl leucosis is an infectious disease and transmitted by a filtrable virus. The incuba-

tion period of the disease is rather long, with a majority of cases occurring between 4 and 8 mo. The clinical course is variable, extending over a period of weeks or months in some cases, while in others it is comparatively short. No recoveries have been observed, but temporary respites do occur. In the light of our present knowledge it seems rather important that a complete histopathological examination be made of all birds before a definite diagnosis is made. The injection of a suspension made from one type produces all the various manifestations considered to be expressions of this disease. Different suspensions experimentally produce similar results. Neurolymphomatosis associated with iritis, hemocytoblastosis, lymphoid, erythroid, and myeloid types of leucosis are different expressions of the same disease, and all are transmitted by a common etiologic agent. There seems to be a definite inherent difference of susceptibility and resistance in different birds and birds of different strains. The most important methods of control are careful culling, sanitation, and use of breeding stock from resistant sources."

Is paralysis of fowls, as manifested by iritis, transmitted through the egg? C. F. McCLARY and C. W. UPP. (La. State Univ.). (*Poultry Sci., 18 (1939), No. 3, pp. 210–219, figs. 10*).—Observations of 227 chickens hatched and grown in isolation from the parent stock revealed approximately 20-percent incidence of iritis, strongly suggesting transmission of the disease through the egg. "High incidence of fowl paralysis in the control group of birds indicated spread by contact. The incidence of iritis in the progeny of parents with iritis was found to be greater than it was in those from parents with normal eyes. Slight cases of iritis did not greatly decrease the mean body weight of individuals so affected. Coccidiosis and parasitic infection apparently played no part in the incidence of iritis in this test. Dipping hatching eggs in chlorine water had no ill effect on hatchability."

A bibliography of 30 titles is included.

Imminence of pullorum: The occurrence of Salmonella pullorum in species other than the chicken, H. BUNYEA. (U. S. D. A.). (*U. S. Egg and Poultry Mag., 45 (1939), No. 9, pp. 562–564, 574*).—This summary is presented with a list of 33 references to the literature cited.

Use of the rapid whole-blood test for pullorum disease, H. BUNYEA (*U. S. Dept. Agr., Misc. Pub. 349 (1939), pp. 18, figs. 9*).—A practical account with explicit information concerning the qualifications of a pullorum testing agent, including the details of technic and equipment necessary for the work.

A note on a mortality due to Salm[onella] typhi-murium infection among ducks, D. F. STEWART (*Austral. Vet. Jour., 15 (1939), No. 2, pp. 67, 68*).—A mortality in ducks due to infection with *S. typhimurium* in New South Wales is reported upon.

Erysipelothrix rhusiopathiae associated with a fatal disease in ducks, R. GRAHAM, N. D. LEVINE, and H. R. HESTER. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 211–216, figs. 2*).—In an outbreak on a farm in Illinois in which approximately 10,000 ducklings succumbed to an acute septicemic disease, *E. rhusiopathiae*, or a culturally and serologically indistinguishable micro-organism, was isolated from some of the ducks after death. "The strains of *E. rhusiopathiae* isolated from ducks were pathogenic for pigeons, mice, and ducks. Rabbits and guinea pigs proved resistant to the subcutaneous injection of suspensions of agar cultures. Several healthy, mature birds inoculated with strains of the micro-organism isolated from spontaneously affected ducks remained healthy, suggesting the possible significance of age as a factor in resistance. The influence of environmental factors was suggested by the high mortality in one house in which the birds were subject

to drafts and temperature fluctuations. Attempts to protect ducklings (with erysipelas serum and bacterins) on contaminated premises and environmental conditions under which the spontaneous disease developed were not successful."

A list is given of 18 references to the literature.

Preliminary note on the occurrence of *Leucocytozoon smithi* Laveran and Lucet (1905) in turkeys in the southeastern United States, B. V. TRAVIS, M. H. GOODWIN, JR., and E. GAMBRELL. (U. S. D. A. et al.). (*Jour. Parasitol., 25 (1939), No. 3, p. 278*).—A survey conducted following the finding of *L. smithi* in blood smears from a sick domestic turkey on a plantation near Newton, Ga., revealed the presence of this disease among domestic turkeys in Alabama, Georgia, South Carolina, and Florida, in addition to Virginia, previously reported by Johnson et al. (E. S. R., 79, p. 687). It was also found in wild turkeys in Missouri. Of 10 wild turkeys examined, 5 of which were from Georgia and 5 from Florida, all were found infected with this parasite. Of 447 adult domestic turkeys examined, 369 were infected. "Chickens, peafowls, guinea hens, and ducks were examined on farms where there were infected turkeys, but no leucocytozoa were found in these fowls. Although sufficient data were not obtained in the survey to indicate definitely which species of insect were responsible for the transmission of the disease in the Southeast, it was noted that in low areas in Georgia and Florida where wooded marshes and ponds were numerous nearly 100 percent of the adult turkeys were infected with *L. smithi*. This suggests that some aquatic breeding insect is involved." Although recorded by Johnson et al. from captive wild turkeys in Virginia, it has not previously been reported from turkeys in the wild.

The efficiency of the blowlamp for the destruction of coccidial oöcysts in poultry-houses, C. HORTON-SMITH and E. L. TAYLOR (*Vet. Rec., 51 (1939), No. 27, pp. 839–842*).—In the experiments reported the resistance of coccidial oocysts to the blowlamp flame was found to be approximately the same as that of *Chromobacterium prodigiosum*. "One second's exposure to the blowlamp flame was found to be sufficient to kill both *C. prodigiosum* and coccidial oocysts, but approximately 0.5 sec. on rough surfaces sometimes failed to kill both of these organisms. It was found to be necessary to spend more than 20 sec. in flaming a square foot of clean rough board in order to kill all *C. prodigiosum* that had been painted onto it. *C. prodigiosum* spread in a very thin film of feces onto a square foot of rough board survived 70 seconds' flaming. It is necessary to spend more than 100 sec. in flaming a square foot of smooth wood, rough wood, zinc, or asbestos, if damp, in order to kill all *C. prodigiosum* present. The disinfection of the interior of a poultry house only 20 ft. long and 12 ft. wide by the blowlamp would therefore take from 2 to 16 hr. to complete, and it must be concluded that the blowlamp is a very inefficient means of sterilizing large surfaces. It is thought probable that these results also apply to coccidial oocysts."

Studies on the development of the pigeon capillarid *Capillaria columbae*, E. E. WEHR (*U. S. Dept. Agr., Tech. Bul. 679 (1939), pp. 20, figs. 3*).—The results of experiments conducted to determine the transmissibility of the pigeon capillarid to chickens and turkeys under natural conditions are reported, together with an account of control measures applicable. The eggs of *C. columbae* were found to develop to the infective stage within 6 to 8 days when kept at room temperature. "Cultures of nonembryonated and embryonated eggs of *C. columbae* suspended in a small quantity of water were found to be very resistant to low temperatures. Nonembryonated eggs were found to be viable and to complete embryonation after an exposure of 35 days to a temperature of −5.6° to −9.4° C. when subsequently exposed to room temperature. Embryonated

eggs were found to be infective to pigeons after an exposure of 14 days to a temperature of —6.7° to —12.2°. Drying for 24 hr. at room temperature destroyed the vitality of partly embryonated eggs. . . .

"The life history of *C. columbae* was shown to be of the direct type. The unhatched embryo has not been observed to molt within the egg. The first-stage larva molts and becomes a second-stage larva early in the second week of infection. The second-stage larva completes its development and molts to the third stage before the fourteenth day after infection. The transition from the third to the fourth stage occurs between the second and third weeks of infection, and mature worms may be recovered from the small intestines of experimentally infected birds as early as 19 days after infection. Eggs have been found in the feces of the birds 26 days after infection. In experimental studies pigeons necropsied 7 mo. after infection were still infested with *C. columbae*. All stages of the worm penetrate more or less deeply in the intestinal mucosa, the larvae being found somewhat deeper than the adults. Necropsies of many birds have shown that most of the worms usually occur in the middle portion of the small intestine. Heavily infested birds showed symptoms of emaciation, diarrhea, and listlessness; food and water were consumed sparingly; and death was usually the termination of severe infestations. For several days prior to death, infested birds spent considerable time in a huddled position on the ground. The feathers were ruffled and those around the vent were usually soiled with fecal material. As observed by the writer, pigeons naturally infested with *C. columbae* showed on post-mortem examination extensive destruction of the mucosa, frequently with complete sloughing of the mucous membrane. The intestines contained large quantities of fluid. Control of this parasite should be directed toward prevention by thorough sanitation and selection of well-drained areas for permanent lofts. Chickens, turkeys, and pigeons should be raised separately, since all three types of birds are susceptible to *C. columbae* infection."

A list is given of 17 references to the literature cited.

Feline septic metritis treated successfully with sulfanilamide, H. Gordon (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 749, pp. 231, 232*).

Schizotaeniasis in muskrats, O. W. Olsen. (Minn. Expt. Sta. et al.). (*Jour. Parasitol., 25 (1939), No. 3, p. 279*).—An account of the parasitism of muskrats taken near Ely, Minn., by large numbers of tapeworms (*Schizotaenia variabilis* and *S. americana*).

Notes on the fleas of prairie dogs, with the description of a new subspecies, W. L. Jellison (*Pub. Health Rpts.* [*U. S.*], *54 (1939), No. 20, pp. 840–844, figs. 2*).

Resistance of rabbits to larval cestodes, A. B. Leonard (*Jour. Bact., 38 (1939), No. 2, pp. 231, 232*).—An abstract of a contribution reporting on the results of the feeding of approximately 2,000 eggs of *Taenia pisiformis* to normal young rabbits, followed by a study of the tissue responses in the liver. A typical inflammatory reaction was found to occur, resulting in the walling off of many of the larvae so completely that further development was impossible. An equal number of rabbits were fed a similar dose of eggs and at the same time given intravenously 55 ml. of serum taken from rabbits carrying a heavy infection of larval cestodes. "In normal young rabbits approximately 500 larvae began development in the liver, the tissue reaction accounting for the death or definite inhibition of growth in all but about a tenth of the total number. An average of 55 larvae per rabbit continued normal development. In rabbits receiving the serum from infected rabbits at the time of infection an

average of 50 larvae began development in the liver. Only an occasional larva was able to continue normal development. The tissue response in the normal rabbit results in walling off the larvae at the end of a period of 16 to 21 days. In immunized animals the tissue response was greatly accelerated, and complete enclosure of the larvae was accomplished in 6 to 7 days."

AGRICULTURAL ENGINEERING

[Agricultural engineering notes] (*Miss. Farm Res. [Mississippi Sta.], 1 (1938), Nos. 1, p. 7, fig. 1; 3, p. 2, fig. 1; 2 (1939), Nos. 1, p. 2; 2, p. 7, fig. 1; 3, p. 5; 5, p. 8; 6, p. 6; 7, p. 2*).—Brief popular articles are presented as follows: Vol. 1, No. 1, Middle Buster Used to Harvest Sweets, No. 3, Mower-Crusher Perfected by Station Cuts Hay Curing Time in Half, and Vol. 2, No. 1, Mechanical Power Displacing Human Labor to Ever-Increasing Extent, all by T. N. Jones; No. 2, Flue Heated Hotbeds for Earlier Plants, by W. S. Anderson; No. 3, Modern Planting Equipment Suitable to Work of Diversified Farms, by T. N. Jones; No. 5, Small-Area Irrigation Is Practicable and Profitable on Many Mississippi Farms, by L. R. Farish; and No. 6, Mower Adjustment, and No. 7, Slope Percentage a Vital Factor in Erosion Control, both by T. N. Jones.

Surface water supply of the United States, 1937.—Part 3, Ohio River Basin (*U. S. Geol. Survey, Water-Supply Paper 823 (1939), pp. VII+375, pl. 1*).—This paper presents the results of measurements of flow made on streams in this basin during the year ended September 30, 1937.

Floods in the Canadian and Pecos River basins of New Mexico, May and June 1937, with summary of flood discharges in New Mexico, T. Dalrymple et al. (*U. S. Geol. Survey, Water-Supply Paper 842 (1939), pp. IV+68, pls. 9, figs. 7*).—This report presents data pertinent to the floods of May and June 1937, including results of peak discharge determinations made at various points, records of peak stages and discharges and of mean daily discharges during the flood period at 23 regular river-measurement stations, records of rainfall at about 190 places, an isohyetal map showing rainfall over the entire State and two isohyetal maps showing rainfall over the Canadian and Pecos River basins, a discussion of the weather conditions during the flood period, and a summary of records of past floods at all places in New Mexico at which authentic records were available.

The flow of water in the main diversion floodway of the Little River drainage district in southeast Missouri, C. E. Ramser (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, SCS-TP-22, pp. [17], pls. 7*).—It is noted that although floodways are quite commonly used for flood control, but little reliable information upon which to base their design is available. The investigation here reported upon had the primary purpose of evaluating the coefficient of hydraulic roughness, "*n*," in the Kutter formula for cleared and uncleared floodways, and of obtaining related data of value in studies of the hydraulics of floodways. The experiments were made on the main diversion floodway of the Little River drainage district in southeast Missouri. Field surveys were begun in November 1921, and most of the hydraulic data were obtained during the spring of 1922 during a flood stage in the Mississippi River.

The experiments showed, among other results, that where the channel is not located in the center of the floodway the value of *n* for the floodway on one side of the channel may not be the same as that for the other where the distance from the edge of the channel to either of the levees is small. In one set of measurements, the value of *n* obtained for the main floodway north of the channel was 0.0462, for the berm south of the channel 0.0366, and for

the channel 0.0329. The lower value of *n* obtained for the berm south of the channel is attributed to the accelerating influence of the channel velocities. 'The narrower the floodway the greater will be this influence upon the value of *n*. Hence it is seen that the value of *n* to be used in computing the flow on the narrow berm will likely lie somewhere between the values assumed for the channel and the main floodway. It is advisable, however, in order to be on the safe side, to assume the same value of *n* for the berm as for the main floodway."

Black Lands experimental watershed—ground water graphs, 1936–37, W. D. POTTER, H. R. BLANK, and C. E. RAMSER. (Coop. Tex. Expt. Sta.) (*U. S. Dept. Agr., Soil Conserv. Serv. 1939, SCS-TP-24, pp. [2], pls. 20*).—The Black Lands experimental watershed comprises about 5,000 acres of gently rolling farm land drained by Brushy Creek and located about 15 miles southeast of Waco, Tex. The underlying geological structure is briefly indicated. Graphs show the elevation of the water in 84 open and cased auger holes during the water year 1936–37, as plotted from manual measurements. Locations of wells are shown on accompanying maps.

Duty of water investigations (*New Mexico Sta. Rpt. 1938, p. 78*).—Work on duty of water for alfalfa is briefly noted.

Irrigated lands of the Humboldt River area, Nevada, G. HARDMAN, C. VENSTROM, and H. G. MASON. (Coop. U. S. D. A.). (*Nevada Sta. Irrig. Bul. 1 (1939), pp. [3]+36, pls. 14*).—The area here dealt with includes all irrigated land in the Humboldt drainage basin of about 9 million acres in northeastern Nevada except that on Reese River and a few scattered farms on other small streams which do not reach the Humboldt. This bulletin presents a general description of the area, its climate, agricultural development, and soils; erosion; alkali and drainage; water supply and irrigation; quality of irrigation water; types of farming; and land classification.

[**Tile drainage trial at the Indiana Station**], A. T. WIANCKO, G. P. WALKER, and C. ROBBINS (*Indiana Sta. Cir. 244 (1939), pp. 5, 6*).—A tile drainage experiment designed to determine the value of tile drainage and the most practical size, depth, and spacing of tile lines on the Clermont silt loam of the Jennings County Experiment Field is very briefly noted.

Terrace outlets and farm drainageways, C. L. HAMILTON (*U. S. Dept. Agr., Farmers' Bul. 1814 (1939), pp. II+46, figs. 27*).—This is designed as a practical guide for the construction and maintenance of terrace outlets and the protection, improvement, and maintenance of drainageways serving as channels of surface drainage for the upper parts of watersheds or in unit drainage basins. It is noted that "the scope of this material is limited to surface run-off disposal measures required in upland or rolling terrain where slopes are steep enough to cause channel erosion. It does not cover surface drainage or underdrainage of flatlands where natural drainage is inadequate."

Public Roads, [June and July 1939] (*U. S. Dept. Agr., Public Roads, 20 (1939), Nos. 4, pp. [2]+65–82+[1], fig. 1; 5, pp. [2]+83–106+[1], figs. 18*).—These numbers contain data on the status of Federal-aid grade-crossing, highway, and secondary or feeder road projects, all as of May 31, and June 30, 1939, respectively. No. 4 also contains data on State motor-fuel consumption and tax receipts, motor-vehicle registrations and receipts, and motor-carrier tax receipts, all for 1938, and the following articles: Toll Roads and Free Roads (pp. 65, 66, 75), and Tests of Concrete Curing Materials, by F. H. Jackson and W. F. Kellermann (pp. 67–75). No. 5 contains an article entitled Application of the Results of Research to the Structural Design of Concrete Pavements, by E. F. Kelley (pp. 83–104).

Looped wire for concrete reinforcement, A. R. LEGAULT (*Colorado Sta. Bul. 452 (1939), pp. 22, figs. 7*).—A theoretical consideration of the design of joists indicates a possible reduction of steel costs of approximately 50 percent by the use of ordinary bright, basic wire at a working stress of 30,000 lb. per square inch as is now allowed in the American Concrete Institute Code, and a still greater saving by the use of high tensile-strength steel which would permit steel stresses double those permissible in ordinary reinforcing bars. This bulletin reports four series of preliminary experiments on the design of wire-reinforced concrete joists.

The first series of tests was made to determine the minimum vertical and horizontal spacing of small, smooth wires without decreasing their effectiveness as tension reinforcement. This determination was necessary because wire reinforcing would necessitate crowding from 5 to 50 strands of wire into a 2-, 3-, or 4-in. joist width, and the conventional rules for spacing cannot be used.

The second series had the purpose of determining what steel stress could be developed by embedding the looped wire in concrete and what diameter of loop and depth of embedment gave the best results. No. 8 wire was mostly used in these experiments, and in most cases of comparison gave better results than No. 3.

Series 3 consisted of experiments designed to develop a practical method of anchoring the end of the wire after the coil is wound. For this purpose pieces of the No. 8 wire were bent at the end in various ways, embedded in concrete blocks, and tested for pull necessary to cause slippage.

In the fourth series beams 6 by 6 by 32 in. were made to determine if high elastic-limit steel wire could be made to give results comparable to those obtained with twice the quantity of ordinary reinforcing bars. From this last series of experiments it would appear, in part, that one-half the steel area of high elastic-limit wire will give substantially the same beam strength as the full balanced percentage of ordinary reinforcing bars. The deflections were higher with the high elastic-limit steel, but at working stresses were found not to be high enough to be objectionable.

The cost of using farm machinery in Indiana, E. L. BUTZ and O. G. LLOYD (*Indiana Sta. Bul. 437 (1939), pp. 17, figs. 8*).—This bulletin presents a detailed study of initial cost, operation, maintenance and repairs, age depreciation, and the like. Among other observations, it was noted that most farm implements decrease in value from depreciation far more rapidly than from use.

Economic study of harvesting with the small combine in Indiana, J. C. BOTTUM, W. R. ROTHENBERGER, and I. D. MAYER (*Indiana Sta. Bul. 436 (1939), pp. 21, figs. 8*).—A subtitle of this study restricts the discussion to that of machines having cutter bars 6 ft. or less in length.

The average cost of harvesting 65 acres or more with such machines was less than that of harvesting with a binder and thresher. Average total acre costs for combining with the small machine were less than one-half of the total acre costs of combining with the binder and thresher, and less than one-fifth as much man labor was necessary.

With correct machine adjustment and operation, the small combine saved a higher percentage of wheat and soybeans than did the binder and thresher, but a lower percentage of the oats. The quality of small grains threshed by the small combine, properly operated, was usually equal to that from stationary threshers, but the quality of soybeans was much better. Harvesting with the combine must be done from 7 to 14 days after the normal time for binder cutting for wheat and rye and from 3 to 10 days for oats, barley, and soybeans.

On livestock farms, reclaiming the loose straw cost about $2 per ton, or, if done by hired pick-up baler machines, the custom charge was $3 per ton. In grain farming the straw spread on the field is considered an asset.

Detailed analysis of savings as against increased costs on 1 farm of 235 acres showed $173 increased costs against $233 savings, or a calculated cash advantage of $60. The operator of this farm considered the addition of the combine a profitable change.

Farm buildings in relation to farm management in Indiana, L. ROBERTSON (*Indiana Sta. Bul. 435 (1939), pp. 48, figs. 22*).—The average farm of 166 studied in 4 areas in central and northern Indiana had 1 barn, 1 poultry house, 1 brooder house, 1 corncrib, from 1 to 10 (an average of 3) individual hog houses, and 2 or 3 other buildings. Farm business buildings (not including dwellings) represented one-seventh of the total farm capital and had an annual cost of $1.88 per tillable acre on 767 Indiana farms in 1937. Detailed data on nature, size, location on farm, floor space, storage capacity, type and cost of construction, and other phases are given.

Silo types and construction, J. R. MCCALMONT (*U. S. Dept. Agr., Farmers' Bul. 1820 (1939), pp. II+62, figs. 54*).—This supersedes Farmers' Bulletins 825 and 855 (E. S. R., 37, p. 789; 38, p. 190). It discusses various types of silos, and gives data on which to determine the dimensions necessary and much constructional detail in the case of each type. Drawings, dimensioned where necessary, and photographs illustrate this material.

A conspicuously placed warning against gas danger in silos, describing a lighted lantern test for the presence of dangerous concentrations of carbon dioxide and simple means for effecting the diffusion of such accumulations before entering the silo, is included. First-aid treatment of victims of silo gas suffocation is also briefly described.

AGRICULTURAL ECONOMICS

Proceedings of the Fifth International Conference of Agricultural Economists, held at Macdonald College, Canada, 21 August to 28 August, 1938 (*London: Oxford Univ. Press, 1939, pp. XIV+436, [pls. 2], figs. [5]*).—Included in addition to the addresses of welcome, opening address by President L. K. Elmhirst, minutes of the sectional group meetings, and constitution and list of members of the conference, the following papers and discussions were presented: The Social Implications of Economic Progress in Present-Day Agriculture, by J. F. Booth (pp. 27–40) and M. L. Wilson (pp. 41–56) (U. S. D. A.), with discussions by K. Meyer (pp. 56-68), A. W. Ashby (pp. 68–77), J. D. Black (pp. 77–90), C. A. Dawson (pp. 90–92), H. Niehaus (pp. 92–97), E. C. Young (pp. 97–102) (Purdue Univ.), R. D. Craig (pp. 102–110), L. C. Gray (pp. 110–115) (U. S. D. A.), and C. E. Ladd (pp. 115–117) (Cornell Univ.); Land Tenure and the Social Control of the Use of Land, by C. von Dietze (pp. 118–139) and H. C. Taylor (pp. 140–149), with discussions by A. Stewart (pp. 149–155), J. D. Black (pp. 155–158), L. H. Bean (pp. 158, 159) and L. C. Gray (pp. 159, 160) (both U. S. D. A.), V. P. Timoshenko (pp. 160–168), H. C. M. Case (pp. 168–175) (Univ. Ill.), E. Lang (pp. 175–178), S. Higginbottom (pp. 178–181), B. H. Hibbard (pp. 181–184) (Univ. Wis.), I. Szladits (pp. 184–186), H. M. Conacher (pp. 186–188), M. Ezekiel (pp. 188–191) (U. S. D. A.), and G. S. Wehrwein (pp. 191–194) (Univ. Wis.); Farm Labour and Social Standards, by F. W. von Bülow (pp. 196–204) and J. F. Duncan (pp. 205–214), with discussions by W. Seedorf (pp. 214–221), A. H. Brown (pp. 221–227), L. Löhr (pp. 227–229), L. Nelson (pp. 229–234) (Univ. Minn.), M. G.

Evans (pp. 234–239) (U. S. D. A.), G. Stockmann (pp. 239–242), F. Windirsch (pp. 242–244), S. Higginbottom (pp. 244–246), C. Y. Shepherd (pp. 246–250), and P. P. Egoroff (pp. 250, 251); International Trade in Relation to Agricultural Development, by G. Minderhoud (pp. 256–263) and H. A. Wallace (pp. 264–277) (U. S. D. A.), with discussions by A. Hobson (pp. 277–282) (Univ. Wis.), O. Master (pp. 282–288), G. Mackenroth (pp. 288–294), O. Pfleiderer (pp. 294–297), A. W. Ashby (pp. 297–301), J. F. Duncan (pp. 301–304), A. Stewart (pp. 304, 305), and S. Schmidt (pp. 305–307); Seigniorial Tenure in Canada, by C. Gagné (pp. 316–324); Some Economic Aspects of Agriculture in Argentina, by P. O. Nyhus (pp. 325–335); Recent Changes in New Zealand's Economic Policy, by A. H. Cockayne (pp. 336–356); Agricultural Co-operation in Canada, by A. E. Richards (pp. 357–367); The Mexican Agrarian Reform, by R. Fernandez y Fernandez (pp. 368–377); National and Local Taxation in Rural Areas, by B. H. Hibbard (pp. 378–386) (Univ. Wis.); Some Remarks on the Land Tenure of the Western Slavs, by S. Schmidt (pp. 387–392); and Recent Agricultural Experience in Eire, by J. Johnston (pp. 393–400).

[Investigations in agricultural economics by the Mississippi Station] (*Miss. Farm Res. [Mississippi Sta.], 1 (1938), No. 1, p. 2; 2 (1939), Nos. 1, p. 1; 4, p. 8; 5, p. 1*).—The 8-yr. averages for crop yields, milk production, feed costs, returns per cow, net income, etc., on a 14-acre farm operated by the station are reported by J. S. Moore in volume 1, number 1. Volume 2 includes in No. 1 reports by M. Guin of the average costs, expenses, and profits or losses of 66 farmers in growing tomatoes, beans, cabbage, and peas in Copiah County, in No. 4 the average receipts, costs, and profits on 56 dairy farms in Oktibbeha and Lowndes Counties; and in No. 5 an article by H. B. Vanderford showing for two areas of Tishomingo County a correlation between the quality of the soil and types of dwellings and home conveniences.

Current Farm Economics, [June 1939] (*Oklahoma Sta., Cur. Farm Econ., 12 (1939), No. 3, pp. 65–94, figs. 7*).—In addition to the usual tables of indexes of prices and purchasing power of farm products and demand deposits, the following articles are included: Agricultural Situation, by the staff, department of agricultural economics and extension economists (pp. 67–72); Hog Production in Oklahoma, by P. Nelson and M. Hill (pp. 72–81); Quality, Yield, and Production of Cotton in Oklahoma 1938, by K. C. Davis (pp. 81–88); and Wheat Farm Incomes Highly Unstable, by P. Nelson (pp. 88–92).

[Investigations in agricultural economics by the Rhode Island Station, 1937–38] (*Rhode Island Sta. Rpt. [1938], pp. 6–10*).—Some preliminary findings are included on the effect of feeding roughage to dairy cows, based on the analysis of 6,000 Dairy Herd Improvement Association records covering a 7-yr. period; on the types of farms in the State, changes in crop yields and production costs, and the costs, labor income, etc., on 43 dairy and 40 poultry farms; and on sources of the Rhode Island milk supply, the sales of class 1 milk in the Newport, Fall River, and Providence markets, and the prices in Providence.

Foreign Agriculture, [July 1939] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 3 (1939), No. 7, pp. 279–318, fig. 1*).—Included are articles on The Soviet Ukraine—Its People and Agriculture, by L. G. Michael (pp. 281–306), Polish Fiber-Supply Policy, by H. L. Franklin (pp. 307–312), and Royal Hungarian Museum of Agriculture, by J. P. Wilson (pp. 313–316), and notes on the Argentine-Brazilian exchange agreement, Colombia to aid the cattle industry, and Taiwan rapidly achieving self-sufficiency in jute.

A statistical analysis of land ownership in North Dakota, 1935, S. Wilner and R. L. Schafer. (Coop. U. S. D. A. et al.). (*North Dakota Sta. Bimo. Bul.,*

1 (1939), No. 6, pp. 10–14, figs. 2).—Data are presented as to types of owners and their distribution by counties.

Ownership of farm land in South Dakota, January 1, 1938 *(Brookings: S. Dak. State Planning Bd., 1938, pp. [1]+69, pl. 1, figs. 22; Sup., pp. [1]+91, figs. 82).*—A brief history is included of land settlement, the entry laws, and survey systems. The types of, trends in, and factors contributing to change of ownership, tenancy, and the acquisition, transfer of title of farm lands, and the county ownership patterns are described.

The supplement includes maps showing for the several counties of the State the lands owned by individuals and corporations, public lands, lands occupied by cities and towns, and lands subject to tax deed.

Readjustments of agricultural tenure in Ireland, E. R. Hooker *(Chapel Hill: Univ. N. C. Press, 1938, pp. XII+245, [figs. 8]).*—Following a description of the historical antecedents of the tenure system prevailing when reforms were begun and the tenure arrangements affecting the various classes of the agricultural population, the experiments in tenure adjustment on the regulation of landlord-tenant relations, transformation of tenants into owners, congested districts, holdings for men with too little land or with no land, and aid to rural laborers are discussed.

The farmer looks at soil conservation in southern Iowa, A. C. Bunce *(Iowa Sta. Bul. 381 (1939), pp. 117–163, figs. 14).*—Using data obtained in a survey made in 1937, the effectiveness of the program of the U. S. D. A. Soil Conservation Service is discussed.

Of the farmers cooperating in the program, 55 percent reported that sheet erosion and almost 70 percent that gully erosion had been greatly reduced or stopped. Nearly all stated that farm values had been increased, the average increase being $5.44 per acre. Over 50 percent of the farmers reported that labor requirements were not affected by terracing, strip cropping, and contouring. Strip cropping and contouring decreased tractor fuel requirements, and contouring made the work easier for horses. In general, the practices and structures introduced met the farmers' expectations, and the farmers reported that with the exception of those requiring large financial outlays or specialized technical knowledge they would continue to use them even if assistance were withdrawn. Practically all the farmers believed the A. A. A. program alone was insufficient to control erosion, but they stated the adjustments had been important in carrying out the conservation program. There was no indication that the reduced acreage of intertilled crops had resulted in a decrease of concentrate-consuming animals fed, and the farmers stated that they intended to increase the number of such animals.

An economic study of land utilization in the tobacco area of southern Maryland, J. W. Coddington and D. E. Derr. (Coop. U. S. D. A.). *(Maryland Sta. Bul. 424 (1939), pp. 161–218, figs. 22).*—This study is based on data secured in previous studies and survey records for 1935 for 160 farms mostly in northern Calvert and eastern Prince Georges Counties, together with farms selected at random in Anne Arundel, Charles, and St. Marys Counties. The characteristics of the area—physical features, number, type, and size of farms, population, trends in land use and tobacco production, tenure and age distribution of operators, size of family, and color of operator are discussed. An analysis is made of the data from the 160 farms as to physical characteristics, land utilization, extent of farm operations, diversification of enterprises, consumption needs in relation to home production, and farm returns. Findings for the 40 farms with the lowest percentage of crop land lying idle and the 40 farms with the highest percentage are compared. Some of the findings were: The

difference in the percentages of tillable land were insignificant and both groups could increase the tobacco acreage about 100 percent with a 2-yr. rotation; the high idle group had more land available for diversification of crops but a much smaller amount was so used; the relationship between soil type and topography was similar in both groups; the low idle group had approximately 66 percent of its land in the least erosive class and 5 percent in the most erosive class as compared with approximately 10 and 49 percent, respectively, in the high idle group; the investment per farm was $2,820 higher in the low idle group, but there were only small differences in the distribution; the low idle group averaged six more animal units per farm, having twice the number of cattle and poultry; for the low idle group the average total receipts were $2,773, of which $1,678 was from tobacco, $492 from dairying, and $145 from poultry; total expenses were $1,385 and labor income $948; the average total receipts in the high idle group were $1,624, of which $1,358 was from tobacco and less than $100 from dairy and poultry; and total expenses were $714 and labor income $611.

Certain economic aspects of agriculture in the Jackson County soil-conservation area, E. C. Weitzell. (Coop. U. S. D. A.). (*West Virginia Sta. Bul. 291 (1939), pp. 56, figs. 9*).—This is a progress report covering the first year's changes on 187 farms in the soil conservation area. The topography, soils, climate, social aspects of the farm families, size of farms, farm investment, land use, farm practices, crop and livestock production, agricultural and nonagricultural income, farm receipts and expenses, etc., in 1935 and 1936 are discussed. The types of farming in 1936 in the area and the program of soil conservation are described. Some of the changes per farm from 1935 to 1936 were: Size of farm increased 3 acres; areas in crops, permanent pasture, and woods not pastured increased 0.3, 4, and 3.5 acres, respectively, and that in woods pastured decreased 2.4 acres; the percentages of cropland in erosion-resistant and semiresistant crops increased 2.5 percent and 1.5 percent, respectively, and that for nonresistant crops decreased 4 percent; animal units increased 0.4; total agricultural receipts increased $177, consisting of a decrease of $4 for crops and an increase of $161 from livestock and livestock products, and $20 from miscellaneous receipts; nonfarm receipts increased $67; operator's labor income increased from −$204 to −$102; and operator's earnings (labor income plus nonfarm receipts and value of perquisites) from $333 to $499. The average labor incomes and operator's earnings in 1936 from different types of farms were: General farms −$137 and $482, beef farms −$99 and $603, dairy farms $958 an $1,563, poultry farms −$53 and $529, self-sufficing farms −$133 and $204, and part-time farms −$477 and $647.

Cost and utilization of power and labor on Iowa farms, W. D. Goodsell (*Iowa Sta. Res. Bul. 258 (1939), pp. 317–363, figs. 10*).—This study is based upon the actual experiences of 1,961 farmers as shown by 869 farm management association records, 842 nonassociation records, 425 tractor and 125 horse records, and approximately 250 farm survey records kept or obtained in 1936 and 1937. The types of power on the cooperating farms are described. Analysis is made of the costs of operation of horses, tractors, and trucks; the horse, machinery, tractor, and man-labor costs on horse, standard tractor, and general-purpose tractor farms; and the performance of tractors and horses in farm work. A comparison is made of the organization and management of farms of similar size and having similar amounts of livestock but operated with different types of power, including discussion of the effect on costs of length of time a given type of power has been used, the influence of type of power on land use and crop yields, and the sources of income on farms operated with different types of power.

The general-purpose tractor farms were considerably larger than the standard tractor farms, which were larger than the horse farms. The average hours of horse work per farm were 814 in 1936 and 802 in 1937, and the average costs per hour were 11.2 ct. and 10.7 ct. The average number of hours varied from 680 on farms with approximately 75 acres in crops to 854 on farms with about 375 acres in crops. Feed costs per horse varied from $56 to $71. The amounts of roughage fed did not differ with size of farm or hours worked. The pounds of grain fed per horse varied from 2,050 on the smaller to 4,518 on the larger farms, due to the larger number of hours the horses were worked. Operating costs per hour and horsepower hours for different types and sizes of tractors were: General-purpose 1-plow 54 ct. and 5.5 ct., general-purpose 2-plow 52 ct. and 4.7 ct., general-purpose 3-plow 60 ct. and 5.2 ct., standard 2-plow 63 ct. and 4.9 ct., and standard 3-plow 70 ct. and 4.4 ct. Tractors on pneumatic tires used 22 percent less fuel and had an estimated life 34 percent longer than steel-wheeled tractors, but these economies were offset by tire costs. The average yearly mileage and costs of operation per mile for farm trucks were: 1½-ton 3,024 and 6.3 ct., 1-ton 3,660 and 5.1 ct., and ½-ton 5,441 and 3.9 ct.

Labor costs per acre were slightly higher on horse farms than on tractor farms of comparable size, but there was no consistent difference in the combined costs for labor, horses, tractors, and machinery on general-purpose tractor and horse farms. Those on standard tractor farms were higher. On general-purpose tractor farms 4.9 hr. of man labor and 27.46 drawbar horsepower hours, and on horse-operated farms 9.4 hr. of labor and 30.88 drawbar horsepower hours, were used per acre of corn up to harvest. Managerial ability of the farm operator was the most important factor in power costs.

Flue-cured tobacco farm management, F. L. Underwood (*Virginia Sta. Tech. Bul. 64 (1939), pp. 313, figs. 8*).—The analyses in this bulletin are based on survey records for 1933 from 620 tobacco and 47 nontobacco farms in central Pittsylvania County. The climate, elevation and topography, soils, soil erosion, transportation facilities, markets, etc., of the area are described. An analysis is made of the farm business—capital, crops, livestock, farm practices, receipts, expenditures, profits, etc., and the factors affecting farm income—rate of production, labor efficiency, horse and machinery efficiency, size of business, capital efficiency, soil erosion, specialization or balance of the business, and personal factors, such as age, education, color, and tenure of operator. A more detailed analysis is made for the tobacco enterprise of the costs and practices in growing, harvesting, curing, and marketing, and the effects on costs and returns of such factors as acreage, varieties, yields, prices, quality, etc., size of the tobacco business, factors affecting prices, soil factors, fertility practices, distribution and efficiency of labor, etc.

For the entire farms the averages were: Acres operated 142, percentage of acreage in crops about 25, receipts $879, expenses $730, labor income —$92, number of work animals 2.08, and number of other animal units 3.27. For the tobacco enterprise the averages were: Acres 8.3, yields 642 lb. per acre, price $13.67 per 100 lb., production costs $126.70 per acre, days of labor per acre 44, net return per acre —$39, and returns per hour of labor 10.8 ct. Total production costs per acre were about $100 less and net profits $120 to $130 higher on the larger than the smaller acreages. Yields of 800 lb. or more per acre returned 15 to 18 ct. more per hour of labor than did yields of less than 500 lb. Efficiency in labor used was the most important factor affecting production costs. Farms on which the work units per man were 270 or more had a labor income averaging $628 more than those farms having less than

150 work units per man. In general, large businesses were the most profitable. With less than $1,500 total capital tenants fared better than owner-operators, and with less than $250 croppers fared better than tenants. The farms with the best balanced businesses were the most profitable. Under comparable conditions the labor incomes of white and colored operators were about the same. Under similar conditions as to size and quality of farm, tenants had larger labor income than owners. As between farms, the most important factor affecting the variation in income was quality of the tobacco crop and the second yield per acre.

An economic study of milk distribution in Maine markets, G. F. Dow (*Maine Sta. Bul. 395 (1939), pp. 523–674, figs. 11*).—Detailed cost records and other information as to labor utilization, use of equipment, volume of sales, sales outlets, credit granted, source of milk supply, investment, etc., were obtained by personal interviews for the year ending April 30, 1935, from 126 milk distributors in the Portland, Waterville, and Bangor areas, and for the year ending April 30, 1936, from 140 distributors in seven somewhat smaller areas throughout the State. The distributors interviewed comprised 43 percent of those in the areas, and handled approximately 75 percent of the total volume of milk and cream sold. The market areas, business conditions, milk supply, State and municipal milk regulations, kinds of milk and cream sold, volume of sales, prices, etc., are described and discussed, and various factors are analyzed.

The milk sales comprised 87 percent of the total butterfat distributed in the seven smaller markets, and 75 percent in the three larger markets. Cost of dairy products constituted nearly 60 ct. per dollar of sales, and distribution costs (including interest on capital at 5 percent), 43 ct. for the four large distributors and 30 ct. for the smaller distributors. The net income or profit for distributors of raw milk varied from 8 ct. for the small to 16 ct. for the large distributors, and from 14 ct. for the small distributors to a loss of 3 ct. during the year preceding the establishment of the State milk control for the large distributors of pasteurized milk. The rate of profit was approximately the same on wholesale and retail sales and for milk and cream. All distribution costs of retail milk averaged 4.36 ct. per quart, of which man labor comprised about 50 percent, depreciation and repairs 9.3 percent, taxes 6 percent, and other costs 33.7 percent. Plant costs averaged 36 percent, containers 5 percent, selling and delivery 51 percent, and administration 8 percent. Labor used by raw milk distributors was 5.5 hr. per 100 qt. when the volume of milk distributed was large, and 8.5 hr. where it was small. Distributors of pasteurized milk used slightly less labor but had considerably higher costs due to higher wages. Expenditures for advertising per $100 of sales was 1 ct. for the small raw milk distributors, 13 ct. for the larger raw milk distributors, and $1.27 for the four large distributors of pasteurized milk. Costs per 100 qt. were: Equipment 12 ct. for raw and 29 ct. for pasteurized distributors, use of buildings 8 ct. and 17 ct., respectively, milk loss 10 ct., and containers 15 ct. Bad debts and interest on accounts receivable averaged 2.1 ct. per $1 of sales. The four large distributors in the Portland market delivered 303 qt. per route daily of retail milk equivalent at an average cost of $2.94 per 100 qt. as compared with 130 qt. for all other distributors at average costs varying from $1.44 for the larger volumes to $2.13 for the smaller volumes, averaging $1.55.

An economic study of the hatchery industry in Maryland, P. R. Poffenberger and S. H. DeVault (*Maryland Sta. Bul. 426 (1939), pp. 255–289, figs. 9*).—One hundred and ten hatcheries located throughout the State were studied

for each of the 2 yr. ended June 30, 1938. The development of the industry, the number, functions, types, capacity, etc., of hatcheries in the State, the seasonality of business, sources of and prices paid for eggs, sources of and quality of chicks purchased by Maryland poultrymen, relation of hatchability to egg costs, disposition of and method of delivering chicks, etc., are described. An analysis is made of the various costs in hatching and marketing chicks, and the effects of different factors on profits. Comparisons are made between the 27 most profitable and the 27 least profitable hatcheries.

The average profit per 100 chicks hatched was \$3.22 for the most profitable hatcheries, —\$1.02 for the least profitable, and \$1.84 for all hatcheries studied. The average number of chicks hatched and costs for fuel per 100 chicks were approximately 120,000 and 14 ct., 29,900 and 35 ct., and 116,900 and 18 ct., respectively, for the most profitable, least profitable, and all hatcheries. The average labor costs and investment per 100 chicks were 46 ct., \$1.53, and 68 ct., and \$4.30, \$15.82, and \$5.02, respectively. The percentages of hatchability of eggs set were 72.6, 67.2, and 71.6, respectively. Losses were sustained when cost per 1,000 chicks hatched exceeded \$4.50 for fuel and \$13 for labor.

The largest profits were made where the egg cost per 100 chicks hatched was \$2.99 or less. Profits increased from 30 ct. per 100 chicks when the hatchability was below 65 percent to \$2.23 when it exceeded 75 percent. Average profit per 100 chicks was 23 ct. higher for hatcheries using eggs from pullorum-tested flocks than those with eggs from nontested flocks. The hatcheries paying a premium of 10 ct. or more per dozen for eggs had the highest selling price and profit per 100 chicks sold. Profits per 100 chicks hatched with different numbers hatched were: 9,999 or less —88 ct., 10,000 to 19,999 46 ct., 20,000 to 39,999 \$1.53, and 80,000 or more \$1.82. Profits increased from \$1.09 where the hatchery capacity was 9,999 chicks or less to \$1.88 where it was 80,000 or more chicks. Hatcheries not used to capacity showed a loss of \$1.89 per 100 chicks. Those setting 2 to 2.9 times and 5 times and over the capacity showed profits of \$1.98 to \$2.01. Hatcheries with average selling prices of less than \$2 and from \$3 to \$4 per 1,000 chicks had the highest profits. Profits increased as the number of days the hatchery was operated increased.

How the Government aids the poultry industry, J. W. KINGHORNE and R. E. MILLER. (U. S. D. A. et al.). (*Washington: Govt., 1939, pp. [1]+IV+72+[1], figs. 56*).—This publication was prepared to supplement the exhibits of the Federal Government at the Seventh World's Poultry Congress and Exposition held at Cleveland, Ohio, July 28–August 7, 1939 (E. S. R., 81, p. 465).

Agricultural Marketing Service: Organization and functions, C. W. KITCHEN ET AL. (*U. S. Dept. Agr., Agr. Market. Serv., 1939, pp. [4]+95, figs. 4*).—The general services and divisional activities of the Agricultural Marketing Service are described.

Egg auctions: Selected references, H. BROWN (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 4 (1939), pp. 20*).—This mimeographed list includes 88 annotated references.

Year book of agricultural co-operation, 1939, edited by THE HORACE PLUNKETT FOUNDATION (*London: P. S. King & Son, 1939, pp. VII+558, [figs. 2]*).—Included are articles on Agricultural Co-operation in 1938 (pp. 1–15); Sir Horace Plunkett as Co-operator, by H. F. Norman (pp. 16–48); Agricultural Co-operation in the World Today, by C. R. Fay (pp. 49–58); Co-operation and the State, by Prof. Ashby (pp. 59–77); The Phosphate Co-operative Company of Australia, by A. Wolskel (pp. 78–95); The Co-operative Society in Rural Hygiene, by H. A. Izant (pp. 96–108); The Building of Agricultural Co-operation in Turkey, by H. Wilbrandt (pp. 109–132); Communitarian Rural Settlements

in Palestine, by H. Viteles (pp. 133–153); and Co-operation in Mexican Agriculture, by G. Fabila (pp. 154–183); and articles by different authors on cooperation in various countries, review of legislation during the year, lists of books, surveys, and reports published during the year, and a selected bibliography.

Principles and procedure for organizing cooperative cotton gins, O. T. Weaver and U. H. Prickett (*Farm Credit Admin. [U. S.], Coop. Res. and Serv. Div., Misc. Rpt. 17 (1939), pp. [3]+62*).—Some of the desirable features of a cooperative gin, local factors important in determining whether such a gin is needed, and the financial structure and dividend policy of cooperative gins are discussed. The steps in the organization procedure are outlined, and suggested forms for organization papers are included.

Crops and Markets, [July 1939] (*U. S. Dept. Agr., Crops and Markets, 16 (1939), No. 7, pp. 125–152, figs. 2*).—Included are the crop and market reports of the usual types. Tables show by States the acreages, estimated yields, and production July 1, 1939, of important crops, and the stocks of corn, oats, and old wheat on farms July 1, 1939.

Index numbers of Idaho farm prices, C. O. Youngstrom (*Idaho Sta. Mimeog. Leaflet 34 (1939), pp. 22, fig. 1*).—This mimeographed circular brings the tables in Bulletin 210 (E. S. R., 73, p. 866) up through February 1939.

RURAL SOCIOLOGY

[Sociological studies in New Mexico]. (Partly coop. U. S. D. A.). (*New Mexico Sta. Rpt. 1938, pp. 11–14*).—The topics for which data are reported are the economic and social effects of a definitely planned program of soil conservation; and market outlets and local uses for fruits, vegetables, and field crops produced in New Mexico.

[Investigations in rural sociology in Rhode Island] (*Rhode Island Sta. Rpt. [1938], pp. 51–56*).—Topics discussed are a study of the characteristics and occupations of 1,100 part-time Rhode Island farmers, and some characteristics of the rural population.

Planning for a permanent agriculture (*U. S. Dept. Agr., Misc. Pub. 351 (1939), pp. III+71*).—This publication, prepared for the use of community and county land-use program planning committees, summarizes the programs administered by the Department that influence the use of the land.

Educational deficiency, low income, handicap daughters and sons of underprivileged, D. Dickens (*Miss. Farm Res. [Mississippi Sta.] 2 (1939), No. 6, p. 2*).—This discussion is based upon Bulletin 318 (E. S. R., 78, p. 128). Public provision of more educational facilities than in the past is discussed as one of the most important means of improving the occupational situation of the young people in the State.

An analytical study of a rural school area, H. L. Fulmer (*South Carolina Sta. Bul. 320 (1939), pp. 71, figs. 47*).—This study is based largely on conferences with parents, pupils, and teachers for 10 rural school districts in the western part of Pickens County in northwestern South Carolina, data being collected as of the 1936–37 school year. The average cash income per family was below $325 per annum, and only $297 of property per pupil was available for taxation. Only $4.54 per pupil was allowed for school purposes.

A close relationship was found between "the environment of the homes, the taxable resources, and the efficiency of the schools. . . . The small district school system is the insurmountable obstacle in the way of the school progress of these rural children. . . . An administrative unit large enough to permit a

complete general school program with all necessary administrative services is needed. A consolidated or centralized school would prove of great social and educational value to this rural community." "The aid for building as well as for operating will, however, have to come from outside many of these small districts," and the provision of State and Federal aid for these purposes is advocated.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Teaching dairy-cattle selection, W. B. NEVENS and A. F. KUHLMAN (*Illinois Sta. Cir. 495 (1939), pp. 27, figs. 10*).—This is a manual for the use of leaders of 4-H club dairy products to supplement Circular 486 (E. S. R., 80, p. 386).

FOODS—HUMAN NUTRITION

Adjustments in agriculture and family living needed for improved nutrition in the South (*Assoc. South. Agr. Workers Proc., 40 (1939), pp. 35-39*).—Abstracts are given of the papers comprising this symposium as follows: Nutrition as a National Problem, by G. Hambidge (U. S. D. A.); Changes in the Southern Diet Suggested by Food and Nutrition Research, by J. Whitacre (Tex. Expt. Sta.); The Functions of Community Storage Lockers in Relation to the South's Nutrition Problem, by K. Beach (La. State Univ.); Changes Needed in Southern Agriculture for the Production of Adequate Food Supply, by O. Steanson (U. S. D. A.); and Adjusting Family Living for Improved Nutrition, by L. Collier.

Plant, animal, and human nutrition in relation to social and economic life of the South (*Assoc. South. Agr. Workers Proc., 40 (1939), pp. 27-30*).—Abstracts are given of the papers comprising this symposium, in which plant nutrition is considered by J. E. McMurtrey (U. S. D. A.); meat in animal and human nutrition by C. A. Elvehjem (Univ. Wis.); and human nutrition by C. Winters (Univ. Tex.), with discussion by O. D. Abbott (Fla. Expt. Sta.).

A tested scale for evaluating food production for farm families, D. DICKINS (*Miss. Farm Res. [Mississippi Sta.], 1 (1938), No. 1, p. 7*).—The yearly food supply scale developed for use in the investigation reported in Bulletin 320 (E. S. R., 79, p. 142) is given, with a brief explanation of its use.

[Foods and nutrition research by the New Mexico Station] (*New Mexico Sta. Rpt. 1938, pp. 61-65, figs. 4*).—Further progress is reported in the study of the flavin and vitamin B_6 content of pinto beans and the effect of cooking on these factors (E. S. R., 79, p. 129).

The physical and chemical characteristics of lards and other fats in relation to their culinary value.—II, Use in plain cake, B. LOWE and P. M. NELSON (*Iowa Sta. Res. Bul. 255 (1939), pp. 145-216, figs. 4*).—This report is based upon a series of graduate theses by E. L. Martin, E. I. Buel, L. C. Minard, and E. Myers working under the direction of the senior author. The lards and other fats used throughout the investigation were the same as noted in the previous report of the series (E. S. R., 80, p. 704). A single recipe was used but with several methods of combining the ingredients. Other factors studied for their effect on the quality of cakes made with the various shortening agents were the creaming qualities and volumes of the different fats, the relation of creamed volumes to cake volumes and to cake scores, the relation of humidity to cake scores, the effect of viscosity of the batter on cake texture and scores, the effects of different kinds of fat and texture of the fat, and the temperature of the ingredients when combined.

Among the objective tests used for rating the cakes were a new test for tenderness called the breaking angle test which is described and illustrated, the texture index or sand retention test of Swartz (E. S. R., 80, p. 132), and microscopic examination of the cakes by a technic developed by Minard under the guidance of E. R. Becker. This was used to observe the fat distribution in the cakes as affected by kind of fat, temperature, and method of combining.

The time required to reach the maximum volume during the creaming process was found to depend on the speed of agitation, the quantity of material, the proportion of fat to sugar, the kind of fat, and the temperature of the ingredients. The time varied from 8 to 210 min. of slow mixing with an electric mixer for the 42 fats used. For each fat there was an optimum temperature for creaming, which was lower for soft fats than for firm fats. Smooth lard creamed to a larger volume than grainy lard from the same source at both 25° and 30° C. A 1 : 1.3 proportion of fat to sugar gave greater creaming volume than a proportion of 1 : 2.6. With the latter proportion and a creaming period of 30 min. at the slow speed of Kitchen Aid and the temperature of ingredients and air from 24° to 25° the creaming volumes for the different fats in decreasing order were hydrogenated lard, hydrogenated cottonseed oil, open-kettle rendered lard, animal husbandry composite lards, animal husbandry individual lards, butter, and prime steam-rendered lard. Comparable volumes were secured with 5-min. creaming by hand. Smooth lards when soft and plastic but not waxy yielded higher scoring cakes than grainy lards. Palatability was affected by the kind and texture of the fat and by the method and temperature of combining the ingredients.

All of the data point to the method of combining the ingredients as one of the most important factors in the quality and palatability of cakes, particularly when made with lard. The effect of different combining methods on the distribution of fat in the cake was strikingly brought out in the microscopic studies. Methods in which the egg is added to the milk or added last, either with or without a portion of the sugar to the batter, improved markedly the quality and palatability of cakes made with oils and to almost as great an extent of cakes made with lards. Even cakes made with butter usually ranked higher when the egg was added last than when added to the creamed mixture. Of all the methods tried, the conventional sponge in which one-half of the sugar is beaten into the egg to form a light fluffy sponge and folded into the cake batter last was outstanding.

Studies on all-purpose flour, M. V. Davis and E. G. Halliday (*Cereal Chem., 16 (1939), No. 3, pp. 414–418*).—Five brands of so-called all-purpose flour from different parts of the country were analyzed for protein and moisture content and used with standard recipes in making butter cake, yeast bread, and baking powder biscuits, which were scored in three series for each product. The flour with the highest protein content gave the highest score for bread and biscuits and one of a lower but not the lowest protein content for cake. The total scores for the three products did not vary widely, ranging from 259 to 269 on the basis of 100 for each product.

Several objective tests were also used on cakes made from the various brands and also a brand of cake flour. The index to volume test of Platt and Kratz (E. S. R., 69, p. 462) gave comparable results for the different all-purpose flours but a considerably higher figure for the cake flour. The compressibility test gave a higher figure for cake flour on the first and second days, but on the fourth day after baking the value was lower than for one of the all-purpose flours. Moisture absorption was also higher for the fresh sample made from cake flour but decreased considerably more than that of the other flours after 3 days.

The sand retention values by the method of Swartz (E. S. R., 80, p. 132) were comparable for all the flours. In breads the loaves made from the all-purpose flour with the highest protein content had the highest index to volume and from the flour with the lowest protein content the lowest. All but one of the flours gave similar results with the compressibility test, but there was no significant difference in the oven spring or the amount of water required to make a dough. With biscuits all of the flours ranked high on the main points of texture, flavor, crumb color, and volume, but there was considerable variation in symmetry, crust color, and character of the crust. The authors conclude that all of the flours tested may rightfully bear the label all-purpose.

A study by the paired feeding method of the nutritive value of bread made with milk solids, B. W. Fairbanks. (Univ. Ill.). (*Cereal Chem., 16 (1939), No. 3, pp. 404–414*).—In this extension of an earlier study (E. S. R., 80, p. 131) controlled feeding technic was used, and in addition to records of the body weights of the experimental rats body lengths were determined. At the end of the experiment the carcasses of the animals were subjected to analysis for proximate and calcium and phosphorus composition. Each of the seven groups of rats consisted of three carefully matched animals, one of which was fed a no-milk bread and the other two breads containing 6 and 12 percent, respectively, of milk solids. The bread with distilled water constituted the sole diet, which was fed for 49 days to produce equal gains and then for 56 days in equal amounts to the three animals in each group. Because of the limited diet only three groups survived to the end of the period. The other groups were sacrificed when the first animal in the particular group died. The data obtained were analyzed statistically by the method of Student.

By the method of feeding for equal gains the rats receiving the milk solids breads were significantly longer than those receiving the no-milk bread, and the difference between the results for the 6 and 12 percent milk solids breads was significantly in favor of the larger amount. By the method of feeding equal amounts the differences in body length were also significant. The weight gains were significantly greater for the animals receiving the milk solids, but the differences between the two levels were not significant. Analysis of the chemical data showed no significant effect of the milk solids or protein, gross energy, or fat content; a significant increase in the ash and phosphorus content, but with no significance between the two levels of milk solids; and significant differences in the calcium content, with a significance between the two levels. The previous conclusion that the addition of milk solids to a no-milk bread increases the nutritive value of the bread has thus been confirmed, and "the burden of the evidence supports the conclusion that in practical nutrition the nutritive value of the 12 percent milk solids bread is of a higher order than that of the 6 percent milk solids bread."

Observations on the hydrogen-ion concentration of cakes, O. E. Stamberg and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 3, pp. 419–423, fig. 1*).—Observations are reported on the pH of commercial cakes and the effect of alterations in certain ingredients on the flavor, eating quality, and pH of white and yellow cakes baked in the laboratory. In the commercial cakes a series of 6 white cakes gave an average pH of 7.47, 3 yellow cakes of 7.59, 8 chocolate cakes of 8.48, and 4 angel food cakes of 5.67. The highest scores for the laboratory-produced cakes were given in both yellow and white cakes as those within a pH range of 7.0–7.9. Outside this range the cakes were distinctly inferior when baked with either a phosphate or a tartrate baking powder. The pH was affected chiefly by the baking powder both in terms of quantity and of quality. Dry milk solids had little effect on the pH, and there was no appreciable change in pH on storing the cakes for 3 days.

Vegetables have added food value, O. SHEETS (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *No. 5, p. 2*).—Attention is called to insufficiency of iron as the most common defect in the diet of many farm families in the South. The function of iron in hemoglobin formation and prevention of anemia is discussed, and tabulated data are given on the hemoglobin-regenerating properties of the common leafy vegetables and legumes of the South.

Variations in cooking quality of potatoes as influenced by varieties, J. L. HADDOCK and P. T. BLOOD (*Amer. Potato Jour.*, *16* (*1939*), *No. 5, pp. 126–133; also New Hampshire Sta. Sci. Contrib. 72* (*1939*), *pp. 126–133*).—In a study of factors which affect the cooking quality of potatoes, the authors believe that the number of samples of any lot should never be fewer than 50, but a reasonably accurate rating under almost any uniform condition should be possible with 100 tubers. The specific gravity test is thought to be a much more accurate measure of mealiness and cooking quality than can be obtained by subjective judging. The procedure which has been developed for determining specific gravity of potatoes by immersing them in salt solutions of varying concentration and classifying the tubers as having the same specific gravity as the solution in which they float is described, and comparisons of specific gravity with mealiness are reported for certain varieties grown in different parts of the State and of specific gravity with cooking quality for a single variety grown on different plats. In the majority of cases potatoes ranking from slightly mealy to very mealy had specific gravities from 1.08 to 1.1, while no samples classed as soggy or waxy had a higher specific gravity than 1.07. Potatoes judged excellent in cooking quality were all in the groups having sp. gr. 1.09, 1.1, and 1.105. In quality rating samples having an average sp. gr. 1.093 were given a quality rating of 93.

Specific gravity tests applied to several varieties grown in two localities gave comparable readings for a single variety. The order of quality rating of 5 out of 7 varieties was the same in the two localities, although the actual values were lower in all instances in the samples from one locality than those from the other. The varieties tested, with their quality ratings, were Green Mountain 94 (Colebrook) and 82 (Chichester), Smooth Rural 89 and 75, Russet Rural 84 and 81, Cobbler 83 and 73, Warba 81 and 71, Chippewa 79 and 65, and White Rose 71 and 60, respectively.

Adhesion of potato-tissue cells as influenced by pectic solvents and precipitants, C. J. PERSONIUS and P. F. SHARP. (Cornell Univ.). (*Food Res.*, *4* (*1939*), *No. 3, pp. 299–307, figs. 4*).—In continuation of the series of studies on potato tuber tissues (E. S. R., 81, pp. 591, 592), this paper records the results of attempts to produce by chemical means a softening of the tissues similar to that obtained in cooking. Comparable samples of potato tissue were placed in beakers containing various reagents and kept in a thermostatically controlled electric oven at 65° C., and samples were removed from time to time for tensile strength measurements. The pH of each solution was determined electrometrically. The reagents used included lactic acid in solutions of varying pH and a number of salts. The potatoes were for the most part tubers which had been in storage at 4.4° (40° F.) for at least 4 mo.

Under the conditions of the experiment extensive decreases in cell adhesion took place in solutions of ammonium oxalate, sodium citrate, and sodium fluoride and in lactic acid solutions having a pH of 3 or less. Definite but less extensive decreases in cell adhesion also took place in samples held in water, potato juice, and 0.2 N solutions of sodium or potassium chloride, and little or no decrease in solutions of 0.2 N barium, calcium, magnesium, or strontium chlorides. These results are thought to support the belief that the

intercellular cementing material of potato tissue is pectic in nature, and that doneness in potatoes is attained when the material has been weakened to the point at which the tissue cells can be separated readily. Samples held in 0.2 N solutions of aluminum, cupric, or ferric chlorides also showed decided decreases in cell adhesion, but this was attributed to the acidity of the solutions rather than to any effect of the cation. Further evidence that the softening of the tissues was due to the removal of calcium from its combination with the intercellular cementing material in the tissue or the formation of soluble salts was obtained by reversing the reaction by treatment of the softened tissues with calcium chloride solutions.

The results have not yet been duplicated with new or immature potatoes or with potatoes stored at temperatures other than 4.4° C. or for periods shorter than 4 mo. This is thought to suggest that the changes in the nature and amount of pectic substances in the potato during maturing and storage play an important part in the cooking qualities of potatoes and also that the cation content of the potato itself and the water in which it is cooked play an important part.

Oxalates in pineapples, H. E. Clark. (Hawaii. Pineapple Prod. Expt. Sta.). (*Food Res., 4 (1939), No. 1, pp. 75–79*).—This paper is devoted chiefly to a discussion of the difficulties encountered in attempts to determine accurately the oxalic acid content of pineapple juice. Quantitative recoveries of oxalic acid from water solutions containing graded amounts of the material were obtained only with concentrations equivalent to 0.024 percent or more of the fresh tissue. One sample of pineapples of the Cayenne variety, which is most widely grown in the Hawaiian Islands, gave a value of 0.008 percent. All others fell below 0.005 percent. It is concluded that the exact determination of the oxalic acid present must await the development of a reliable micromethod accurate for very small concentrations. However, it is considered that the concentration is so low that it has no physiological importance in human nutrition.

Nutritional and health values of frozen desserts, W. H. E. Reid. (Univ. Mo.). (*Ice Cream Trade Jour., 35 (1939), No. 2, pp. 20, 40, 42, 55*).—This is a nontechnical discussion of the food value, purity, and palatability of ice cream manufactured and merchandised by modern methods. Attention is called to the importance of serving ice cream at a temperature which best brings out the texture and flavor. This is considered to be at about 12°–14° F.

Sanitary condition of paper containers for retail packaging of perishable foods, J. R. Sanborn. (N. Y. State Expt. Sta.). (*Amer. Jour. Pub. Health, 29 (1939), No. 5, pp. 439–442*).—The importance of using clean sanitary paperboard and efficient methods of moisture proofing in the manufacture of containers for perishable foods is shown by comparisons of the bacterial counts per gram of disintegrated paperboard of virgin stock and of secondary stock, of the original paperboard and the finished containers, of containers paraffined at different temperatures, and of various paperboards and the finished containers made from them. It is noted that recently marked improvements have taken place in the bacteriological condition of both paperboard and finished containers as a result of effective programs of cleanliness and microbiological control at pulp and paper mills and container factories.

Quick freeze new quality preservative, J. A. Campbell (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 6, p. 8*).—A brief description is given of methods of preparing vegetables for frozen storage, with a list of suitable varieties of snap beans, lima beans, and peas commonly grown in the State.

Report by the Technical Commission on Nutrition on the work of its third session held in London from November 15th to 20th, 1937 (*League

Nations Health Organ. Bul., 7 (1938), No. 3, pp. 460–502).—In the introduction to this report, progress which has been made in the study of the various nutritional problems noted in the previous report (E. S. R., 75, p. 133) as needing further study is summarized. "Proximate and provisional" recommendations representing the consensus of opinion of the Commission are then given for human requirements of calcium, phosphorus, iron, and iodine; vitamins A, B_1, B (limited to pellagra-preventive vitamin), C, and D; proteins and fats; and the nutritional requirements during the first year of life. This section is followed by sections dealing with the nutritive value of milk, methods of conducting nutrition surveys and of assessing the state of nutrition in infants and adolescents, nutrition problems of the Far East, and studies of nutrition in Chile.

Farm family diets in the Lower Coastal Plains of South Carolina, A. M. Moser (*South Carolina Sta. Bul. 319* (1939), pp. 80, figs. 4).—Essentially the same plan was followed as in an earlier study of the Piedmont section (E. S. R., 73, p. 557). A total of 214 weekly records of foods eaten by white farm families and 183 similar records for Negro families in three counties representing three types of farming areas in the Lower Coastal Plains was obtained in even distribution throughout the year. The average per capita quantities of the principal foods or groups of foods were calculated in the diets classified by food cost levels and by seasons of the year. Estimates were made of the nutritive value of the diets and from these the diets were grouped according to the same standards as used in the earlier study. In the case of vitamins A and C it was considered that the earlier standards were somewhat low and consequently estimates were also made on the basis of 4,000 and 6,000 International Units of vitamin A and 1,500 I. U. of vitamin C for the adult male.

In the presentation of the material attention has been paid to its use by different groups of readers. Part 1 consists of a brief section giving the general plan of the study and the results in terms of diet patterns, with the data presented graphically in weekly per capita consumption of different groups of foods in the A, B, and C diets of the white families and in all of the diets of the Negro families. The frequency by season of diets low in each of several nutritive essentials is similarly presented. Data on the extent of home production of foods and suggestions for improved diets on low country farms are also included in this section. Part 2 consists of the detailed report of the study as to scope and methods and with the results discussed under character, nutritive content, and money values of the diets. An appendix contains all of the tabular material, together with sample menus for the four seasons of the white and Negro families.

The average good or A diet among the white families had greater quantities of milk, potatoes, green leafy and yellow vegetables, tomatoes, and citrus fruits and lean meats, poultry, and fish than the average fair B or poor C diet. The C diets were higher in cereal products and in fats and fatty foods and had more lean meat, poultry, and fish than is usually considered necessary for for well-balanced diet. The pattern of the average Negro diet had many of the characteristics of the poor diets of the white families, although the consumption of milk, cheese, etc., exceeded the average C diet of the white families, of potatoes the B and C diets, of dried legumes and nuts all of the diets, and of leafy green and yellow vegetables the B diets of the white families. About 60 percent of the diets of the Negro families represented such low money value that good diets were practically impossible. Only 31 of the 214 records from white families fell in the group of weekly per capita money value of 62 ct.–$1.23, while 94 of the 183 records from Negro families were in this group and there were 2 records of less than 62 ct. per week.

In comparison with the Piedmont section the diets of the Coastal Plains farm families at a given cost level contained almost twice as much lean meat, poultry, and fish and not over half as much milk. Other characteristic features of the Coastal Plains diets were the relatively large amounts of rice and the more liberal quantities of fish and sea food at all levels. It is concluded that the supplements needed for improvement of the typical Coastal Plains diet can best be secured by increased consumption of milk, vegetables, and fruit. A possible prolongation of the sweetpotato season, provision of a steady supply of green leafy vegetables throughout the year, the greater use of eggs, dried field peas, lightly milled or whole grain cereals, and home-made sirup, and more fresh or canned tomatoes, raw fruits, and raw vegetables are recommended as measures of improving the typical restricted diet at a small increased outlay of time, effort, and money.

Another good old southern custom receives complete vindication, O. SHEETS (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 2, p. 3*).—The custom referred to is the use of hot biscuits and "molasses," and the vindication the high mineral, particularly iron, content of the unrefined sorghum and sugarcane sirups produced extensively in the State.

Plan family diet around the need of growing girls for variety, iron-rich food, D. DICKINS and O. SHEETS (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 4, pp. 1, 8*).—Based on the results of an earlier survey of the food consumption of boys and girls in agricultural high school dormitories in the State (E. S. R., 66, p. 193) and preliminary blood studies made in 1938 on 260 girls and 110 boys shortly after enrolling in college, the conclusion is drawn that the girls are more often below standard in various nutrients, particularly iron, than the boys. It is suggested that the family diet be planned around the needs of the girls, relying upon additional amounts of bread, cereals, sweets, and fats for the additional energy requirements of the boy.

The biological value of the proteins of rice and its by-products, M. C. KIK. (Univ. Ark.). (*Cereal Chem., 16 (1939), No. 3, pp. 441–447*).—Polished rice was compared with whole rice and rice bran with rice polish by the modified paired feeding method of Mitchell, Burroughs, and Beadles (E. S. R., 76, p. 879), using a nitrogen-free ration in combination with the protein ration to equalize weight gains. Nine pairs of rats were used for each comparison. In every instance the whole rice-fed rats utilized their food better than the paired animals fed polished rice, and those fed rice polish than those receiving rice bran. The differences were in all cases significant. One gm. of nitrogen from the whole rice ration was as effective for maintenance and growth as an average of 1.08 gm. from the polished rice ration and 1 gm. of nitrogen from the rice polish ration as effective as 1.2 gm. from the rice bran ration. The average gains in weight per gram of protein were 1.8 and 1.66 gm. for whole rice and polished rice and 1.79 and 1.48 gm. for rice polishings and rice bran. The biological values at a 5 percent level of protein were whole rice 72.7, polished rice 66.6, rice bran 84.9, rice polishings 82.9, and casein 81.5, respectively. At an 8 percent protein level rice polishings gave a value of 78.9 and rice bran 71.9 in comparison with whole milk powder 85.6, skim milk powder 87.8, casein 69.5, and lactalbumin 84.

The utilization of the calcium in various greens, M. SPEIRS. (Ga. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 6, pp. 557–564*).—The procedure followed in the experiments reported was similar to that developed by Fincke and Sherman (E. S. R., 76, p. 129) and consisted essentially in comparing the utilization of calcium by from 3 to 6 young rats placed at weaning on diets in which practically all of the calcium was furnished by skim milk powder with that of

matched animals receiving the same diet with half of the calcium of the milk powder substituted by that of dried greens. At 60 days of age the animals were killed and their entire bodies, minus the intestinal tract, analyzed for calcium.

The utilization factor for calcium, expressed as the ratio of calcium retained to that ingested, was on the control diet in which skim milk furnished all of the calcium 0.8±0.05 for males and 0.78±0.06 for females. On the other diets the utilization factor decreased in the order turnip greens, tendergreens, kale, collards, and New Zealand spinach for the males. For the females the value for collards was higher than for kale. With all of the greens except New Zealand spinach the values were within a range of 0.77±0.03 for turnip greens (male rats) to 0.66±0.04 for kale (female rats). The New Zealand spinach gave values of 0.14±0.08 for males and 0.21±0.1 for females. These very low values are considered to indicate that not only the calcium in the New Zealand spinach but probably some of that of the milk was rendered inactive by oxalate.

The influence of different levels of milk intake on the acid-base mineral balances of children, H. A. HUNSCHER, F. C. HUMMEL, and I. G. MACY (*Jour. Nutr., 17 (1939), No. 5, pp. 461–471*).—This paper reports a series of nitrogen and acid-base balances for seven healthy children from 5 to 10 yr. of age over 715 experimental days, during which they were consuming 400, 600, 800, or 1,000 gm. of milk daily in addition to basal diets composed of 21 common foods easily obtained throughout the year. For the different subjects the diet was kept constant in quality of the mixed foods, but adjusted in quantity to meet individual physiological needs. The average daily intake of the various nutrients on the basal diet, including 400 gm. of milk, amounted to 1,676 calories, approximately 70 gm. of fat, 212 of carbohydrate, 57.35 of protein, 0.91 of calcium, and 1.25 gm. of phosphorus. At this level of milk, the average excess of base over acid in the food intake was 0.6 milliequivalent per kilogram per day (6 cc. 0.1 N alkali) and the range 0.5–0.7 m. e. per kilogram. When the milk was increased to 1,000 gm., the average excess of base over acid in the intake increased to 1.6 m. e. per kilogram per day.

All of the children stored both acid and base at all levels of milk intake, but the quantities stored were greater on the higher than the lower levels. The mean daily balance of excess base for all of the subjects on the 400-gm. intake was 0.2 m. e. (2 cc. 0.1 N base) per kilogram of body weight as contrasted with 0.9 m. e. (9 cc. 0.1 N base) during the daily ingestion of 1,000 gm. of milk. The urine, which constituted the major outlet of both acid and base, at all times contained an excess of acid over base, and the feces more base than acid, this increasing with higher levels of milk.

All of the children gained in recumbent length and in weight, but the amounts of these gains appeared to have no direct relationship to the quantity of excess base stored. The retentions of nitrogen were positive at all milk levels, ranging from 2.1 to 40.4 mg. per kilogram of body weight daily on the 400-gm. level to from 46 to 60.7 mg. on the 1,000-gm. level. "These results indicate that neither the recumbent length, the weight gains, nor the excess base balance alone give an index to the type of chemical growth that is taking place. The retention of nitrogen is a more exact measure of growth than is the increase in weight, which may be due in a varying degree to body water or fat. . . . With the changes to higher levels of milk intake the increased calcium: phosphorus ratios indicate gains in rate of synthesis of skeletal tissue over the rate of soft tissue construction, and bear out the fact that the kind of chemical growth accruing at any particular time is characteristic of the individual child with his peculiar inherent physiologic needs in reponse to the growth impulse as well as to the type and quantity of food that he consumes."

Adequacy of cow milk as a source of magnesium for rats, H. G. Day and E. Orent-Keiles (*Soc. Expt. Biol. and Med. Proc., 40 (1939), No. 4, pp. 638–640*).—This study was undertaken as a result of a report by Duncan et al. (E. S. R., 73, p. 678) that the nutritional failure of calves on a milk diet supplemented only by iron, copper, and manganese is due to a failure in the magnesium metabolism. No symptoms suggestive of magnesium deficiencies were observed in rats fed as long as 74 days on a diet of pasteurized grade A milk ad libitum supplemented with 0.25 mg. of thiamin per liter and with adequate supplements of manganese, iron, and copper. No difference could be detected in growth and in serum content of magnesium between this group and a group receiving supplements of magnesium in amounts doubling the magnesium content of the milk. Analyses of the bones of the rats on the diets without added magnesium, when sacrificed at 56 and 74 days, showed no decrease in the magnesium content as a result of continued use of the unsupplemented milk. *It is concluded that cow's milk contains enough magnesium to prevent magnesium deficiency in rats.*

Some effects of low choline diets, W. H. Griffith and N. J. Wade (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 188–190*).—In this preliminary report a newly recognized effect of choline deficiency in the diets of rats is described. The basal diet consisted of fibrin 4 parts, casein 8, dried egg white 3, salt mixture 4, calcium carbonate 1, cod-liver oil 5, lard 35, agar 2, and sucrose 38 parts supplemented with thiamin chloride, riboflavin, nicotinic acid, and concentrated extracts of rice polish and hog liver. In animals killed and examined at the end of a 10-day experimental period, 90 percent showed marked hemorrhagic kidneys, as well as fatty livers previously demonstrated by Best and Channon (E. S. R., 76, p. 571). All of the rats on the low choline diet were noticeably sick, the spleen was enlarged, and the thymus decreased to about half its normal weight. *On microscopic examination the kidney tissue showed extensive glomerular and tubular degeneration, with hemorrhagic areas in the cortical region particularly.* The damage to the kidneys was the same whether the vitamin supplements were omitted, fed separately, mixed with the diet, or doubled in amount. The degeneration was prevented when 2 mg. of choline was fed, although this amount had no effect on the liver fat. Ten mg. of the choline was required daily to prevent the fatty liver. Typical fatty livers and hemorrhagic kidneys occurred on a diet in which the lard was decreased from 35 to 15 percent. The condition was severe when all of the dietary protein was supplied by fibrin. The livers were fatty but the kidneys normal when all of the protein consisted of casein or egg white alone.

Prothrombin concentration in newborn, A. J. Quick and A. M. Grossman (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 227, 228*).—*In this preliminary report attention is called to a profound fluctuation in the prothrombin content of the blood of infants in the first 48 hr.* Six hr. after birth the level *is relatively high and not very different from that of cord blood.* By the end of the twenty-fourth hour the values may drop to exceedingly low levels and begin to return to normal at about the forty-eighth hour. This is thought to explain the frequency of hemorrhagic disease in the newborn infant. The infant is born with no reserves of prothrombin and during the first 24 hr. the supply of the factor may be reduced to dangerous levels. The response of the hemorrhagic disease to vitamin K, as shown by Waddell et al. (E. S. R., 81, p. 600), indicates that deficiency of the factor is the cause of the hemorrhagic condition. The abrupt recovery of prothrombin in 48 hr. cannot be attributed to vitamin K in the food supply. The fact that vitamin K can be produced by bacterial action is thought to suggest that with the establishment of an intesti-

nal flora in the infant following the ingestion of food and water "the synthesis of vitamin K begins, which, with the aid of bile, is absorbed, thus ending the danger of bleeding due to prothrombin deficiency."

A method for estimating the degree of mineralization of bones from tracings of roentgenograms, P. B. MACK, A. T. O'BRIEN, J. M. SMITH, and A. W. BAUMAN. (Pa. Expt. Sta.). (*Science, 89 (1939), No. 2316, p. 467, fig. 1*).—The method described consists in tracing by means of a modified recording microphotometer the density of a roentgenogram of the bone from one fixed point to another. "The modification of the original apparatus has consisted in substituting a photronic cell for the thermopile originally in the instrument to obtain greater sensitivity and quicker response, in introducing a means of regulating the current through the light source, in providing for the continuous recharging of a storage battery in the circuit of the light source, and in introducing resistance into the galvanometer circuit sufficient to give critical damping."

The apparatus is illustrated by a diagram, and the method of using it is described in detail. The instrument is being used to make tracings of roentgenograms of both bones and teeth by means of planimeter measurements. Comparative densities of different sections of the same bone or of the same tooth may be found, densities of similar sections of certain bones or teeth of different individuals may be compared, and density values may be calculated in terms of units of a density ladder of known mineral composition.

The diagnostic significance of changes in the red cells, R. L. HADEN (*Bul. N. Y. Acad. Med., 2. ser., 15 (1939), No. 5, pp. 291–310, figs. 11*).—Of particular value in this discussion is a series of charts illustrating the text. These include diagrams of the normal erythron showing the relative volumes of its constituents; the function of the red cells as hemoglobin-filled cups on an endless chain conveyor which continually takes up oxygen from the lungs and gives it up in the tissues; the relative volumes of total blood and circulating erythron under normal conditions (men and women) and in various types of anemia; the physiology of the normal red blood cell in its formation, circulation, and destruction; the measurement of the red cell with values for the different determinations in the normal man; the distribution curves in percentages of cells, cell diameters, and cell volumes of the red cell under normal conditions, in microcytic and hypochromic anemia, and in pernicious anemia; types of anemia represented as varying kinds of endless chain conveyors; anemias due to increased blood loss and decreased blood formation in relative values for the different blood cell measurements; and the changes in the red blood cells in pernicious anemia with adequate liver therapy and in iron deficiency anemia with adequate iron therapy.

A comparison of indices used in judging the physical fitness of school children, S. P. SOUTHER, M. M. ELIOT, and R. M. JENSS (*Amer. Jour. Pub. Health, 29 (1939), No. 5, pp. 434–438*).—This preliminary report of an investigation undertaken to compare various procedures used in evaluating the health of children deals with a limited aspect of the problem, namely, the ability of each of four indices of body build to identify children who are likely to be considered physically unfit as judged by the ratings of the physician concerning the child's general nutrition and by the child's annual rate of gain in weight. The indices selected were the Baldwin-Wood height-weight index, the Pryor width-weight, and the Franzen ACH and nutritional status indices. The subjects were 713 7-year-old white boys and girls living in New Haven, Conn.

The physician who examined the children classified 40 of the 348 girls as poorly nourished. Of these 63 percent were underweight according to the

Baldwin-Wood index and 28 percent by the Pryor index. With the Franzen ACH index 10 percent of the 40 were classified as below par, with the weight index 3 percent and with the indices of arm girth and subcutaneous tissue 5 percent. In the comparison of the annual gains in weight with the classifications by the various indices, the lowest 10 percent of the group according to gains in weight was considered. Of these only 29 percent showed agreement by the Baldwin-Wood index and none by the Franzen nutritional status index. Similar analyses of the findings for the boys showed a like degree of failure in identifying by any of these indices the boys whom the physician considered poorly nourished or whose weight gains were markedly below average.

It is concluded that for the present "the clinical examination must certainly form an integral part of the assessment, especially if determining the need of medical care is to be one of the objectives of a school health program. On the other hand, a great deal can be done to improve the clinical examination and to make the physician's judgment more stable and objective. Provision must also be made for observing the child at regular intervals so that his physical condition can be evaluated in terms of his own previous growth and health. Until the physician is furnished with more satisfactory and practical tools for evaluating the child's physical fitness, it may also be wise to supplement the clinical examination with some simple measure of the child's progress, such as his relative gain in weight."

Basal metabolism of 38 American-born male Japanese university students, F. M. Baldwin and C. K. Fujisaki (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 41–44*).—The average basal metabolic rate, measured indirectly with a Sanborn apparatus, of 38 American-born male Japanese university students in California was −3.4 percent according to the Harris-Benedict and −4.1 percent according to the Aub-DuBois prediction standards. It is noted that these results are in excellent agreement with those reported by Miller and Benedict (E. S. R., 77, p. 420) for Hawaiian-born Japanese high school and college students in Hawaii and by Okada et al. in an earlier study of 42 medical students in Japan. The values in the three studies were within the range of 4 percent. This close agreement for like subjects of the same race in three geographical localities is thought to support the belief that "racial characteristics are retained hereditarily as far as the basal metabolism of Japanese is concerned."

A study of the dietary and value of living of 44 Japanese families in Hawaii, C. D. Miller (*Hawaii Univ., Res. Pubs. No. 18 (1938), pp. [2]+27*).—Thirty-six of the families lived in Honolulu, the others being rural families on the Island of Hawaii. Data on income and value of living for 1 yr. were obtained on schedules based upon the forms of the U. S. D. A. Bureau of Home Economics, and the schedules and itemized records kept by a member of each family for 4 consecutive weeks were used for the diet calculations. The average size of the family was 5.7 persons, and the incomes of individual families ranged from $723 to $3,227 per year, with an average of $1,910. Food expenditures constituted 30 percent, housing 12.7, clothing 14.5, household operation 9.1, formal education 6.6, automobile 5.9, medical and dental 5.4, recreation 4.3, gifts 2.9, personal care 2.8, furnishings and equipment 2.6, other transportation 2, community welfare 1.1, and other items 0.1 percent.

The nutritive value of the diets was studied (1) by comparing the quantity of certain nutritive constituents of the diet with standards used in the United States and Japan, (2) by calculating the distribution of calories among the common food groups, and (3) by comparing the quantities of different foods or groups of foods consumed with similar data for the mainland United States.

According to American standards, there was no serious deficiency of calories, protein, phosphorus or iron except for a few families, but there were deficiencies in calcium and in vitamins A and B in all but a few of the diets. About 60 percent of the calories came from cereals (almost 48 percent from rice) as compared with 74 percent for Japanese families in Japan and 38 percent for American families in the United States. The proportion of calories coming from animal protein was about half that of American families, but greater than for Japanese families in Japan. The proportion of calories from milk (4.9 percent) was much higher than that of Japanese families in Japan (0.4 percent). The proportion of calories derived from fruits was the same (8 percent) as for American families and more than 3 times as much as that of Japanese families in Japan. Japanese families in Hawaii and Japan both obtained about the same percentage of their calories from vegetables, approximately the same legume and legume products, and approximately the same percentage from sugar and sweets. The vegetable consumption was about half that of American families and the consumption of sugar and sweets about 3 percent less than the average for American families. The fat consumption was about twice that of Japanese families in Japan and about half that of American families.

In terms of per capita consumption of different foods the families in the present study showed a very high consumption of white rice in comparison with the United States, only from one-fourth to one-half the consumption of potatoes, and a higher consumption of tomatoes, citrus fruits, and of vegetables other than potatoes. The average consumption of milk, ice cream, and cheese was approximately half that of average American families and of lean meat, fish, eggs, and poultry about the same. Less butter and other fats were consumed.

Basal heat loss and production in women at temperatures from 23° C. to 36° C., J. D. Hardy and A. T. Milhorat. (Cornell Univ.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 94–98, figs. 2*).—In this preliminary report data are summarized on an extension to three normal women of previously reported studies of the effect of environmental temperature on heat loss in nude male subjects (E. S. R., 80, p. 558). Rectal temperatures at 24° were about 0.15° lower than at 36°. The average skin temperature increased linearly with the calorimeter temperature between 23° and 33° and did not change with further increase in calorimeter temperature. Heat loss decreased linearly up to a calorimeter temperature of 31°, and after reaching a low point of 29 calories per square meter per hour at 32° rose slowly with higher temperature. Heat production was constant at 35 calories per square meter per hour between 23° and 27°, at 28° began to decrease slowly, and at 32°–33° reached a low production of 29 calories per square meter per hour. At this point the heat production equaled and from then on followed closely the heat loss. Vaporization was practically constant between 23° and 32°, at which point sweating began. The conduction of the peripheral tissues was almost constant between 23° and 28.5°, with a value corresponding to a tissue thickness of 22 mm. and increased linearly with the temperature from this point to 36°. The cooling constant of Newton's law was constant at 5.3 calories per square meter per hour. A graphic comparison of the findings in this study with those of the male subjects in the earlier study shows identical rectal temperatures and cooling constants but significant differences in the other responses to temperature changes. The skin temperature of women was higher in the warm atmosphere and lower in the cold than that of the men, the threshold temperature for sweating was 2° higher, and the heat production above a temperature of 27.5° was lower than that of the men.

The effect of apple constituents on the retention by growing rats of lead contained in spray residues, J. B. SHIELDS, H. H. MITCHELL, and W. A. RUTH. (Univ. Ill.). (*Jour. Nutr., 18 (1939), No. 1, pp. 87–97*).—Twelve groups of three newly weaned rats each were fed three diets of like composition except as follows: Diet No. 1 contained no apple powder but its equivalent in starch and agar, diet No. 2 32 percent of apple powder from unsprayed apples, and diet No. 3 32 percent of apple powder from fruits sprayed with lead arsenate. Diets Nos. 1 and 2 contained the same quantity, 54 p. p. m., of lead arsenate furnished by the apple powder in diet No. 3. The lead content of the three diets amounted to 33 p. p. m., the calcium content 0.54, 0.51, and 0.51 percent, and the phosphorus content 0.63, 0.66, and 0.66 percent, respectively. The three diets were fed in equal amounts daily within each trio, but the weights of the trio were kept the same by feeding sugar in concentrated solution to the animals growing at the slower rates. Particular care was taken that no contact with lead was possible. With nine groups the experiments were terminated after 1 kg. of the diet had been consumed and the others after the consumption of 728, 650, and 750 gm. At the end of the period the rats were killed, their body lengths measured, and the carcasses minus the alimentary tract analyzed for lead by the colorimetric diphenylthiocarbazone method. Check rats from each of the litters used were killed at the beginning of the experiment for determining the initial content of lead, the average figure for which was established at 0.046 mg.

The average lead retentions on the three diets were 0.536, 0.345, and 0.329 mg., respectively, equivalent to from 1 to 1.5 percent of the lead ingested. The differences between the retentions on diets 2 and 3 were not statistically significant, showing that the lead contained in the spray residue was as readily absorbed and retained as in the original spray material. The differences between the retentions on diets 1 and 2 and on 1 and 3 were significant, showing that the rats stored less lead in the presence than in the absence of the apple powder. The difference amounted to 37 percent under conditions in which the lead was present in amounts of 96 p. p. m. of the apple solids as compared with 22 p. p. m. in apples containing no more lead than the legal tolerance. The demonstration that the apple contains within its tissues a substance or substances (probably pectic constituents) that exerts a considerable effect on the intestinal absorbability of the lead component in spray residues is thought to suggest that in feeding experiments concerned with the possible toxicity of lead in lead arsenate spray residues on fruits, rations containing the fruit solids should be used unless it can be shown that the fruit itself does not modify the assimilability of the lead.

Effect of avitaminosis A on the human blood picture, O. D. ABBOTT, C. F. AHMANN, and M. R. OVERSTREET. (Fla. Expt. Sta.). (*Amer. Jour. Physiol., 126 (1939), No. 2, pp. 254–260, figs. 3*).—The method described for detecting vitamin A deficiency in rats by differential leucocyte count (E. S. R., 80, p. 852) has been tested on human beings with consistent results. The subjects, 157 in all, consisted of college students and rural school children whose diets had been habitually low in vitamin A and women who, because of overweight, had been subsisting on diets restricted in calories and consequently quantitatively low in vitamin A. All showed symptoms of vitamin A deficiency in loss of vigor, general weakness, dry hair and skin with desquamated areas, and eye defects varying from burning and redness of the lids to well-defined conjunctivitis, including in a few cases actual involvement of the cornea. Blood tests were made before and at 10-day intervals during treatment with 51,000 U. S. P. units of vitamin A daily. The characteristic changes from normal in this blood

picture were a mild leucopenia, a decrease in the polymorphonuclear neutrophils, a relative increase in large lymphocytes with a corresponding drop in small lymphocytes, the occurrence of degenerative cells, and an increase in the number of juveniles. "It will be noted that this blood picture is similar to that of rats fed a diet deficient in vitamin A and, as in the case of the rats, the administration of large amounts of vitamin A brought about a gradual improvement in symptoms and in a few weeks the differential count was within the normal range. From this work it was concluded that the differential leucocyte count is of value in diagnosing a deficiency of vitamin A in man."

Effect of pectin supplements on avitaminosis A in rats, A. Kobren, C. R. Fellers, and W. B. Esselen, Jr. (Mass. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 1, pp. 117, 118*).—The possibility that pectin through its galacturonic acid composition might retard the keratinization of the mucous membranes characteristic of vitamin A deficiency was tested on three groups of rats fed a vitamin A-free diet plus 3, 6, and 12 percent of pectin. In comparison with controls on the deficient diet alone the pectin-fed animals showed no delay in the onset of xerophthalmia. Histological sections of various mucous membranes in the animals sacrificed at the first appearance of xerophthalmia in any of the animals in the group showed marked changes in mucous membranes and submucous coat of the vagina, nares, and eyelids of all of the animals on the deficient diet but somewhat less marked in those receiving pectin.

Vitamin interrelationships.—I, Influence of avitaminosis on ascorbic acid content of various tissues and endocrines, B. Sure, R. M. Theis, and R. T. Harrelson. (Univ. Ark.). (*Jour. Biol. Chem., 129 (1939), No. 1, pp. 245–253*).—Data are summarized from an extensive series of studies of the ascorbic acid content of various tissues and endocrine glands of rats which had undergone single and repeated depletions of vitamin B_1 and of vitamin A and single depletions of riboflavin and of vitamin B_6 in comparison with normally fed and fasting control animals. Fasting for as long as 10 to 11 days and the ingestion of from 4 to 16 mg. of ascorbic acid per day by rats on a satisfactory diet brought about no change in the concentration of ascorbic acid in the organs and tissues examined. In vitamin B_1 deficiency the lungs showed decreases in ascorbic acid amounting to 35 percent, kidneys 23, and livers 19 percent. Repeated depletions produced additional heavy losses. The only significant change in the endocrines was a decrease of 27.8 percent in the ascorbic acid content of the thymus. In vitamin A deficiency decreases in ascorbic acid content were noted amounting to 20 percent in the heart, 27.3 in the kidney, and 24.1 percent in the thymus. As only four groups were examined for the kidney and thymus, the results of these organs were not considered conclusive. In multiple vitamin A depletions with from 12 to 16 groups of animals available decreases were found amounting to 26.6 percent for the kidneys, 45 for the livers, 19.2 for the thymus, and 12.4 percent for the adrenals. In 7 groups in which the pituitaries and 5 in which the thyroids were studied, losses of ascorbic acid amounting to 25.8 and 15.3 percent, respectively, were found. In single depletions of riboflavin the ascorbic acid losses amounted to 44.4 percent for the liver, 45.4 for the kidney, 41.2 for the lung, 85.7 for the thymus, and 20.7 percent for the thyroid. No changes were observed in the adrenals or pituitary. No noteworthy changes in the ascorbic acid content of tissues or endocrines were found in vitamin B_6 deficiency.

The data are thought of significance in suggesting that a deficiency in one vitamin in human nutrition may be responsible for exhaustions of the reserves of other vitamins. "Findings of this nature should be taken into consideration

by practicing physicians and clinicians in their daily experiences with vitamin therapy."

The correlation between vitamin B_1 and vitamin C [trans. title], M. KASAHARA, Y. NISHIZAWA, and S. HIRAO (*Klin. Wchnschr.*, *18* (1939), *No. 7, pp. 246–248, figs. 5*).—Guinea pigs, rats, and pigeons were used as test animals. Tooth response, growth rates, and recovery from polyneuritis, respectively, were the factors studied. The authors considered that the antineuritic action of vitamin B_1 was enhanced and that its growth-promoting effect was influenced by simultaneous administration of vitamin C. Vitamin B_1 was thought to exert a protective effect on scorbutic guinea pigs. These results were interpreted to indicate a synergistic action of vitamins B_1 and C.

Cereals as a source of vitamin B_1 in human diets, R. R. WILLIAMS (*Cereal Chem.*, *16* (1939), *No. 3, pp. 301–309*).—This paper, although written for the cereal chemist, is of general interest in the clear explanation it contains of the necessity of thiamin for carbohydrate metabolism and the significance of its practically complete removal from cereals in the refining processes. In the opinion of the author "carefully to sift the starch from the other parts of the seed and make the starchy endosperm the chief source of energy for human life is to fly in the face of Providence. . . . Only the producer of refined cane sugar can rival the miller of rice or wheat (the world's two largest cereal crops) in the thoroughness of the devitalizing purification process."

Whey as the substratum in vitamin B_1 assays, A. L. DANIELS (*Soc. Expt. Biol. and Med. Proc.*, *41* (1939), *No. 1, pp. 235–240*).—Comparable diets with autoclaved whey, autoclaved yeast, and autoclaved liver as the source of the various heat-stable vitamins of the vitamin B complex in vitamin B_1 assays by the method involving the use of the same animals in two or more assays have proved unreliable with the autoclaved whey. Instead of giving consistent results in successive periods in the amount of thiamin required for unit gain in weight, as was the case when autoclaved yeast or liver was used, the successive assays with whey required an increasingly large amount of thiamin for the same gains in weight. This is thought to indicate an inadequacy in autoclaved whey of a factor present in adequate amounts in autoclaved liver and yeast. The nature of the substance or substances has not been investigated, but the retarded growth without other obvious symptoms is thought to suggest that one component of factor W of Frost and Elvehjem (E. S. R., 79, p. 137) is the substance in question. Attention is called to the failure of appetite in animals receiving the basal whey ration even with added B_1 as an indication that the unidentified factor as well as vitamin B_1 is concerned with appetite.

Determination of a curve of response to synthetic crystalline thiamin for use in the vitamin B_1 assay of foods by the rat-growth method, C. D. MILLER. (Hawaii Expt. Sta.). (*Jour. Nutr.*, *17* (1939), *No. 6, pp. 535–544, figs. 2*).—Curves of response have been established for the growth rate of young rats equally distributed as to sex on graded doses of thiamin in addition to a basal thiamin-free ration over periods of 3 weeks and of 5 weeks. A total of 192 rats was given the basal diet at 21 days of age and at depletion of the thiamin stores in about 20 days. Twenty-five of the animals were used as negative controls, and the others were divided into groups of nearly even size and fed daily doses of synthetic crystalline thiamin at levels of 1, 2, 3, 4, 8, and 16 µg. daily. The results show a definite curvilinear relationship between the mean gains in weight and the quantities of thiamin administered, represented by the equation y (gain in weight) $=3.0+62.3 \log X$ (daily dose of thiamin) for the 3-week period, and $y=9.2+94.9 \log X$ for the 5-week period.

With the exception of the group of rats receiving the 1-μg. thiamin supplement for 3 weeks, all of the mean gains in weight for both periods were highly significant, with no advantage of the 5-week period over the 3-week period. By the analysis of variance method it was established that the number of animals that must be used with the colony in question to obtain reliable results in thiamin assays is 12 for the 3-week and 15 for the 5-week period. The 3-week period is consequently considered preferable from the standpoint of economy in the number of animals as well as in time.

Influence of the composition of the diet on the thiamin requirement of dogs, A. Arnold and C. A. Elvehjem. (Wis. Expt. Sta.). (*Amer. Jour. Physiol., 126 (1939), No. 2, pp. 289–298, figs. 5*).—Vitamin B_1 requirement tests on dogs are reported, with results confirming observations on other species that the requirement for thiamin is best stated as percentage of the diet rather than in terms of body weight, and the conclusion of Williams and Spies that "all species of animals require somewhat less than 1 p. p. m. of thiamin in the food when carbohydrate predominates in the diet to the degree which is usual for most species." It was also shown that fat has a sparing action for vitamin B_1 and that with increased amounts of fat in the diet the requirement is correspondingly reduced.

The relation of dietary fat to the thiamin requirements of growing rats, F. E. Stirn, A. Arnold, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 17 (1939), No. 5, pp. 485–495, figs. 3*).—The sparing action of fat for thiamin has been demonstrated by successive replacements of sucrose in the basal thiamin-free ration of Arnold and Elvehjem (E. S. R., 80, p. 562) by fats on an isocaloric level. When the sucrose was completely substituted by coconut oil after the rats had been depleted to the point of polyneuritis on the regular ration, the subsequent growth and improvement of polyneuritic symptoms were as good on the fat diet with no thiamin as on the sucrose diet with 15 μg. of thiamin daily. The use of butterfat in place of coconut oil made no appreciable difference in the rate of growth. Controls fed the unsupplemented diet died at the end of the fourth week. Partial replacement of sucrose with fat gave results in proportion to the amount substituted. On the smallest amount of fat (7 percent) the polyneuritic symptoms were alleviated, but the recovery period was much longer and growth was poor. When the fat content was 26.2 percent and the sucrose 20.1 percent nearly as good results were obtained as when the fat entirely replaced the sucrose and constituted 39.4 percent of the ration. Rats receiving a diet in which all of the sucrose was replaced by autoclaved fat recovered from polyneuritis in 3 days as compared with 5 hr. on the same diet supplemented with thiamin, but after the first week grew as rapidly as those receiving thiamin. The livers of rats which had been on the autoclaved fat diet without supplement for 3 weeks were found to have similar amounts of cocarboxylase in their livers as were found in polyneuritic rats and much less than rats on the normal diet. There was much less difference in the cocarboxylase content of the brains of the animals in the three groups. A series of trials with various natural fats, including peanut oil, lard, cod-liver oil, cottonseed oil, and also synthetic triacetin gave like responses as to growth, but slower response on some fats than others in the relief of polyneuritis. The fact that growth resulted in the presence of polyneuritic symptoms was thought to indicate that fats produce their effect independently of thiamin.

The results are discussed with reference to seemingly contradictory reports in the literature. The cocarboxylase values in the livers are considered of particular importance in indicating that, while the animals are unable to build up or maintain their thiamin reserves, they are still able to obtain energy for

growth purposes from the metabolism of fat. "In thiamin deficiency the rat preferentially metabolizes fat as opposed to carbohydrate. This wipes out the fat reserves. In the presence of thiamin the rat is able to metabolize carbohydrate normally both for energy and for fat synthesis which allows for an accumulation of fat."

The B vitamins and fat metabolism.—I, Effects of thiamine, riboflavin, and rice polish concentrate upon body fat; II, The effect of thiamine upon the synthesis of body fat in pigeons, E. W. McHenry and G. Gavin (*Jour. Biol. Chem., 125 (1938), No. 2, pp. 653–660, figs. 2; 128 (1939), No. 1, pp. 45–49*).—In the first of these papers evidence is presented suggesting the production of fat from carbohydrate in the bodies of rats fed thiamin, as well as riboflavin and a rice polish concentrate, as a source of vitamin B_6. In the second a similar synthesis in pigeons is suggested through the demonstration of an increased content of crude fatty acid in pigeons receiving thiamin as the only supplement to a polished rice diet.

Nutritional significance of nicotinic acid, C. A. Elvehjem, (Univ. of Wis.), (*Collect. Net, 14 (1939), No. 5, p. 109*).—A brief account is given of the various steps leading to the separation of the antipellagra factor from the other vitamins of the B complex and its identification as nicotinic acid. It is noted that foods containing only fair amounts of nicotinic acid are useless in the treatment of pellagra because the pellagrin is unable to digest the food sufficiently to liberate the nicotinic acid present. It is emphasized, however, that nicotinic acid as such is an emergency measure, and that the goal should be such modifications of the diet as would enable the people in the areas in which it is now endemic to obtain sufficient nicotinic acid, as well as other essentials, from foods.

Effect of nicotinic acid deficiency on the cozymase content of tissues, A. E. Axelrod and C. A. Elvehjem. (Univ. Wis.). (*Nature [London], 143 (1939), No. 3616, pp. 281, 282*).—It is noted briefly that in nicotinic acid-deficient dogs and pigs the blood shows no difference in cozymase before and after nicotinic acid therapy, and that the nicotinic acid-deficient dogs and pigs show no decrease in cozymase content of either brain or kidney from that of similar tissues of animals fed the basal diet plus nicotinic acid. The livers of the deficient animals show a decrease in nicotinic acid of about 100 percent and the muscles as high as 1,000 percent.

The polarized light method for the study of myelin degeneration as compared with the Marchi and Sudan III methods, C. O. Prickett and C. Stevens. (Ala. Polytech. Inst.). (*Amer. Jour. Pathol., 15 (1939), No. 2, pp. 241–250, pls. 3*).—The polarized light method, as recommended by Sutton et al. (E. S. R., 73, p. 134), for demonstrating myelin degeneration due to transection of the peripheral nerves of the rat, was found to be rapid and accurate as compared with the Marchi method, which gave very inconsistent results, and the Sudan III method, which failed to detect the early changes following transection. One or two modifications of the Sutton technic were found to be advantageous. Reducing the thickness of the section from 20μ to 10μ gave clearer details. Uncrossing the analyzer prism was found advantageous "for determining the continuity of fibers which appear segmented, for distinguishing between edema of the axis cylinders and periaxillar accumulation of isotropic material, and for revealing the presence of isotropic fibers masked by the crossed Nicols."

The appearance of normal, and transected nerves under polarized light is described in considerable detail, with illustrative microphotographs.

Histopathology of the peripheral nerves in acute and chronic vitamin B_1 deficiency, C. O. Prickett, W. D. Salmon, and G. A. Schrader. (Ala. Poly-

tech. Inst.). (*Amer. Jour. Pathol.*, *15* (*1939*), *No. 2*, *pp. 251–260*, *pls. 3*).—The polarized light method, as described in the paper noted above, was used in a further study of the disputed question as to the production of myelin degeneration in the peripheral nerves of rats by vitamin B_1 deficiency. The same material was tested by the Sudan III method for comparison. Both acute and chronic vitamin B_1 deficiency was produced in rats, of which a total of 133 were used in the study of acute deficiency and 40 chronic deficiency. The first group was further divided into two groups of 63 animals on diets limited in calories to 12 per rat daily and 70 on corresponding diets fed ad libitum. Each of these groups was further subdivided into three subgroups receiving the vitamin B_1-deficient diet, the same diet plus vitamin B_1, and the stock diet. For the most part the animals were allowed to develop severe neuromuscular symptoms and were killed on an average of 2.5 days after the symptoms developed. Groups studied for chronic deficiency were maintained in this state by the administration of small doses of vitamin B_1 after the severe symptoms appeared. In this group two types of symptoms appeared following partial alleviation of the symptoms of acute deficiency. The first were typical of impaired equilibration and the second of a peculiar ataxic type of walk not often seen in the acute condition and developing in the more severe cases to partial or complete paralysis of one or both hind legs, with impairment of sensation in the affected extremities. These two types of symptoms were often present in the same animal, but in numerous instances one or the other of the symptoms appeared alone.

On autopsy the peripheral nerves of the animals in the deficient and control subgroups of the group being studied for acute deficiency showed no gross abnormalities. In the chronic deficiency group no abnormalities were visible on gross examination in most of the animals, but in a few that had shown severe symptoms localized enlargements were observed along the course of the peripheral nerves. When examined under polarized light the peripheral nerves of rats that had developed symptoms of acute deficiency showed a few fibers of Wallerian degeneration and mild edema. Both of these conditions were also shown by the control rats and by rats that had become moribund without developing typical neuromuscular symptoms. In the various groups the Wallerian degeneration increased in the order—acute deficient, controls, moribund without symptoms, and controls on adequate vitamin B_1 with limited food intake.

In the animals in which a state of chronic deficiency had been produced, marked changes were shown by the polarized light method but not by the Sudan III method. These changes consisted in greatly enlarged fibers in some cases, with large bulbous areas along their course and with increased amounts of isotropic material, the fibers becoming completely isotropic in the most severe cases. It is considered significant in view of these marked changes that a stage is eventually reached in the chronic deficiency when the symptoms cannot be cured even by the administration of relatively large doses of thiamin chloride, indicating irreparable damage to the tissues.

Effect of riboflavin-low diets upon nerves, growth, and reproduction in the rat, R. W. ENGEL and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, *40* (*1939*), *No. 4*, *pp. 597, 598*).—The severe nerve degeneration which the authors have shown to be characteristic of riboflavin deficiency in growing chicks (E. S. R., 80, p. 673) could not be demonstrated in rats on a similar ration. The ration also had no adverse effect on reproduction but was not satisfactory for growth. No improvement was noted on the addition of nicotinic acid.

A study of rachitogenic diets composed of purified food materials, J. H. JONES (*Jour. Nutr., 17 (1939), No. 6, pp. 601–608, fig. 1*).—Blood fibrin, previously noted as a satisfactory source of protein in synthetic diets for rats (E. S. R., 80, p. 274), has been used at an 18-percent level in a series of low phosphorus rickets-producing diets. Diet 570, which proved very successful, was composed of alcohol-extracted fibrin 18 percent, brewers' yeast 5, salt mixture No. 5 (consisting of NaCl 1, $CaCO_3$ 3, KCl 1, anhydrous $MgSO_4$ 0.2, ferric citrate 0.1, and KI 0.004 parts) 5.3, agar 2, carotene solution 0.1, and dextrinized starch 69.6 percent. In the other diets the changes from diet 570 consisted successively in replacing the dextrinized starch with sucrose (diet 573), omitting the yeast and agar, increasing the sucrose to 73.6 percent, and adding liver extract 1 percent, cellulose 2 percent, and thiamin 20 µg. daily (diet 610); omitting the agar and increasing the sucrose to 71.6 percent (diet 576); altering diet 610 slightly by adding 0.56 percent K_2HPO_4 and reducing the percentage of sucrose accordingly (diet 611); using alfalfa 2 percent in place of the agar and carotene of diet 570 (diet 618); and using in place of salt mixture No. 5 in diet 618 1 part of NaCl and 3 parts of $CaCO_3$ (diet 623). In one diet (No. 612) 12 percent of casein replaced the fibrin, the other constituents being salt No. 5 5.3, carotene 0.1, sucrose 78.8, liver extract 1, cellulose 2, and a yeast concentrate 0.8 percent. The phosphorus content of these diets in the order described was 0.08, 0.08, 0.02, 0.08, 0.12, 0.1, 0.1, and 0.14 percent.

Tabulated data on the effect of the various diets in gains in weight, content of ash in the femurs, and calcium and phosphorus content of the blood serums are given, and "demonstrate that it is possible to produce rickets in rats on a diet composed almost entirely of purified food substances if the phosphorus content is maintained at a low level. This furnishes additional evidence in favor of the view that cereals do not owe their rachitogenic properties to the presence of a specific anticalcifying agent. Also it gives a better opportunity for a study of the factors leading to the development of rickets in the rat."

Factor W and its relation to the vitamin B complex, D. V. FROST and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 128 (1939), No. 1, pp. 23–34, fig. 1*).—This paper summarizes hitherto unreported properties of factor W (E. S. R., 79, p. 137), and discusses them in relating this factor to other little known members of the vitamin B complex. By partition between butanol and water at varying pH factor W has been shown to have a weak acidic nature. It is soluble in phenol and aniline but insoluble in ether and cannot be precipitated from alcohol or water by organic acid- and base-precipitating agents. It can be eluted from norite by refluxing the well-dried material with dry butanol, a 1:1 mixture of benzene and absolute ethyl alcohol, and an aqueous pyridine-methanol mixture (2:1:1). Tabulated data are given on the factor W potency of various concentrates prepared from the fuller's earth filtrate of liver extract.

The properties of factor W are discussed with reference to the work of other laboratories, with the conclusion that factor W is distinct from vitamin B_6, the chick antidermatitis factor, and nicotinic acid. The relation which factor W bears to factor 2 of Lepkovsky et al. (E. S. R., 76, p. 889) or to vitamin H of Booher (E. S. R., 79, p. 716) is not clear. There is some evidence that the factor is similar to or identical with the filtrate factor of Edgar and Macrae. Data are also reported showing that the response of rats to nicotinic acid and its amide is dependent on the composition of the ration. It is pointed out that although the fact that addition of one, two, or three members of the viamin B complex may enhance the deficiency symptoms of other members is not new knowledge, it demands more attention in the future than it has received in the past.

The anti-acrodynic properties of certain foods, H. A. SCHNEIDER, J. K. ASCHAM, B. R. PLATZ, and H. STEENBOCK. (Wis. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 1, pp. 99–104*).—The term anti-acrodynic activity is used in this report to signify the activity measured by the cure of the symptoms of acrodynia in rats described as erythemic, swollen, and denuded paws and fissured, swollen, and denuded lips. These symptoms were produced in from 4 to 5 weeks in rats on the diet described by Quackenbush, Platz, and Steenbock (E. S. R., 81, p. 600). The supplements tested were assumed to be curative if at the end of 3 weeks the lips, eyes, and ears were normal in appearance and paws and tails free from all symptoms except slight scaliness. It is noted that these symptoms are only temporarily relieved by crystalline vitamin B_6, and consequently that the measure of anti-acrodynic properties is not a measure of vitamin B_6 alone. Data are reported in terms of minimum curative level and maximum failing level in milligrams per day of 52 food materials. "Fruits and vegetables were found to be poor sources, fish and meat fair, seeds, legumes, and cereals relatively rich, and certain vegetable fats extremely potent sources of anti-acrodynic activity."

Ascorbic acid, a precursor of vitamin C, I, II, [trans. title], H. LUND, E. TRIER, ET AL. (*Klin. Wchnschr., 18 (1939), No. 3, pp. 79, 80, 80–82, fig. 1*).—The Lund and Lieck methylene blue titration method (E. S. R., 79, p. 151) for quantitative determination of ascorbic acid in blood serum is based on the assumption that a given amount of ascorbic acid would have the same reducing value whether in water solution or in the serum as prepared for titration. Actual titrations on samples prepared by adding ascorbic acid to the deproteinated serum (1 mg. per 100 cc.) gave values far short of those obtained on water solutions of similar concentration. The titers were variable but amounted to only 3–61 percent of the theoretical. When the ascorbic acid was added to the serum before deproteinating, the titers amounted to more than 75 percent of the theoretical. These results are interpreted to mean that synthetic ascorbic acid is not identical with that in the blood stream, and further, that the synthetic product is only a precursor of vitamin C into which it is transformed through some particular function of the natural blood serum. The transformation is not effected by the deproteinated serum.

In part 2 a new microtitration method, involving methylene blue reduction and requiring only 0.1 cc. of serum, is described in detail as to reagents and technic. Whereas trichloroacetic acid is used as the defecating reagent in the method of Lund and Lieck, the present method employs lead acetate, which removes certain interfering substances. Either of the two methods may be used to determine the reducing substances occurring spontaneously in blood, but only the micromethod is satisfactory for determining synthetic ascorbic acid, which is considered as a precursor to vitamin C in the blood stream.

The oxidation of ascorbic acid as influenced by intestinal bacteria, W. B. ESSELEN, JR., and J. E. FULLER. (Mass. Expt. Sta.). (*Jour. Bact., 37 (1939), No. 5, pp. 501–521*).—In this in vitro study of the action of animal intestinal bacteria on ascorbic acid and factors influencing its action, it was found that certain bacteria, particularly members of the coliform group, inhibited the oxidation of ascorbic acid in culture media, and the more actively growing cultures in which the largest numbers of bacteria were present had the strongest inhibitory action. When ascorbic acid was present in relatively high concentration, the inhibitory action of bacteria was not observed, presumably because the acidity of the medium was lowered below the point where effective bacterial growth could take place. Killed bacterial cultures or cell-free filtrates from living cultures showed no inhibitory action. Two strains only of

Escherichia coli were able to reduce dehydroascorbic acid to ascorbic acid. "It is suggested that growing bacteria inhibit the oxidation of ascorbic acid by certain combinations of three factors, namely, (1) the formation of un-ionized copper complexes whereby the catalytic action of the copper is destroyed, (2) the production of carbon dioxide with the subsequent saturation of the medium with it, and (3) the lowering of the oxygen tension of the medium. The most effective inhibitory action was obtained by a combination of all three of these factors together."

On the stability of ascorbic acid in solutions, J. LEIBOWITZ and K. GUGGENHEIM (*Ztschr. Vitaminforsch., 8 (1938–39), No. 1, pp. 1–7; Ger., Fr. abs., pp. 6, 7*).—The rate of disappearance of ascorbic acid in water, urine, and bouillon was studied with particular reference to the results obtained under different conditions and in the presence of various substances. Results on the loss of ascorbic acid in aqueous solutions were by no means directly applicable to bouillon or urine. Thus, traces of KCN (0.001 M) exerted a protective action upon ascorbic acid in aqueous solutions, but in urine or bouillon this effect was either absent or very slight. Even in aqueous solutions the preservative action of KCN was limited to the weakly acid range. In all three media the protective action of the KCN was altered by the presence of acids such as CCl_3COOH, H_2SO_4, HCl, and CH_3COOH in 0.1 N concentration. The degree of alteration was variable and apparently not entirely referable to pH changes. Moreover, in the presence of KCN the acid exerted a different effect than it did in the test solution alone. Not all acids exerted a protective action upon the ascorbic acid, and the influence varied with the acid used. KCNS and KI acted as preservatives in aqueous solution but, like KCN, were without effect in urine.

On the detoxicating effect of ascorbic acid, J. LEIBOWITZ and K. GUGGENHEIM (*Ztschr. Vitaminforsch., 8 (1938–39), No. 1, pp. 8–24; Ger., Fr. abs., pp. 23, 24*).—Although KCN in minute amounts, and in a slightly acid medium, inhibits the oxidative loss of ascorbic acid in air, as noted above, the protective action becomes progressively weaker in higher concentrations until above a certain point KCN actually accelerates the loss of vitamin C. This effect results from the formation of a definite compound of KCN and ascorbic acid, the latter constituent being more easily oxidized in this combined state than in its free state. Proof of the chemical combination is afforded by cryoscopic methods (only in an alkaline medium). Reductometric titration indicates that the ascorbic acid in combined form is readily oxidized. KCN that has stood in contact with ascorbic acid for several days is no longer toxic to bacteria or mammals, and this further supports the in vitro evidence that an ascorbic acid HCN compound is formed. The late appearance of the detoxifying effect suggests that it is associated, not with the formation of the compound, but with its subsequent oxidation. It is impossible, however, to protect animals against KCN posoning by the injection of ascorbic acid. After short contact, ascorbic acid also combines with phenol. The latter is thereby detoxified so that it no longer initiates convulsions in rats. Previous injection with ascorbic acid does not protect the rats. The bactericidal property of phenol, which is referable to its protein coagulating ability, is not attenuated by ascorbic acid.

The vitamin C exchange between mother and fetus [trans. title], J. MULLER (*Klin. Wchnschr., 18 (1939), No. 9, pp. 299–301*).—From a review of the literature on this subject, the author presents the following summary:

Vitamin C is not stored in the placenta and there is little possibility of the fetus having the higher ascorbic acid content. Comparative determinations of

the vitamin C content of the liver of the mother, of the placenta, and of the liver of the fetus show that, apart from some variable differences, the vitamin C picture in the fetus is the same as in the mother. The findings contradict the assumption that there is synthesis in the fetus. All the vitamin C that the fetus uses is brought to it through the umbilical vein by way of the placenta. About 40 references to the literature are appended.

Potatoes as carriers of vitamin C, M. E. Lyons and C. R. Fellers. (Mass. Expt. Sta.). (*Amer. Potato Jour., 16 (1939), No. 7, pp. 169–179*).—From this study it may be concluded that variations in potatoes of the same variety grown in different sections of the country may be no greater than individual variations in the same sample; variations among varieties may be no greater than those among different samples of the same variety, although certain varieties averaged somewhat higher than others; the content of ascorbic acid remains rather constant from the first digging until the potatoes are fully matured, but after digging losses amounting to as much as 50 percent may occur on winter storage for 5 mo.; small variations may occur in the same potato of both large and small size; all methods of cooking result in losses which amount to about 40 percent with either baking or boiling; boiled potatoes held at 40° F. for 24 hr. retain approximately 80 percent of their ascorbic acid content and on reheating retain somewhat more of the vitamin if fried than if creamed; boiling in salted water preserves the vitamin to a somewhat greater extent than boiling in unsalted water; and an ordinary serving of potato (150 gm. or 5¼ oz.) may furnish about one-third of an estimated daily ascorbic acid requirement of 50 mg.

Vitamin C content of sauerkraut, C. S. Pederson, G. L. Mack, and W. L. Athawes. (N. Y. State Expt. Sta.). (*Food Res., 4 (1939), No. 1, pp. 31–45, figs. 3*).—An extensive series of chemical determinations of the vitamin C content of sauerkraut in relation to the original cabbage and changes taking place during fermentation, storage, canning, and repacking in barrels is reported.

Raw kraut sampled during and immediately after fermentation in commercial-size vats was found to contain approximately the same quantity of vitamin C as the original cabbage. During storage in the vats after fermentation the content decreased slowly. In samples fermented in smaller containers the loss was more rapid. Canned kraut showed some loss of vitamin C, which was traced primarily to the mixing and preheating before the kraut was put into cans. Little decrease was noted during the further processing and storage. Kraut repacked in barrels lost vitamin C, the loss being more rapid in barrels stored at a low temperature (1° C.) than at a higher temperature (20°) where fermentation continued. The loss of vitamin C in kraut is thought to be associated with the loss of carbon dioxide after fermentation is complete.

Ascorbic acid (vitamin C) in tomatoes and tomato products, W. A. MacLinn and C. R. Fellers (*Massachusetts Sta. Bul. 354 (1938), pp. 39, fig. 1*).—This bulletin includes an extensive review and list of the literature on the subject, with a summary in tabular form of data from all available published reports on the vitamin C content of raw, canned, fermented, and dried tomatoes, tomato conserve, and canned tomato juice; a discussion of biological and chemical methods for the determination of ascorbic acid, with an outline of the technics employed by the authors in the standardization of the dye and preparation and titration of tomatoes and tomato juice, and a comparison of the dye, modified iodine, and bio-assay methods as applied to tomato juice; and the report of the investigation proper, which covered three successive crops of tomatoes, and tests on the effects of various factors on the ascorbic acid content.

The general results of the first year's study of 98 strains and varieties has been noted from a preliminary report (E. S. R., 78, p. 728). In the second year 28 and in the third 22 of the same varieties and strains were tested, thus making possible a seasonal comparison of the same strains and varieties grown on the same soil and with the same fertilizer treatment. The same general relationship among the varieties was shown each year, but in all cases the 1937 crop gave lower values than the 1936, while the 1938 crop gave values more comparable with the 1936 crop. Although there were individual variations due to other uncontrolled factors, the comparison of the data for the 3 yr. tended to show that the ascorbic acid potency in tomatoes may be an inherited characteristic. It is considered that tomatoes should have an ascorbic acid content in excess of 150 International Units per ounce to be classed as higher than average.

No correlation was found between size of tomato and ascorbic acid content. In the one variety tested for distribution in various parts of the fruit, the concentration was highest in the locule section, but the outside flesh and skin contributed the largest percentage of the total ascorbic acid content of the whole fruit. Six varieties showed no significant increase in ascorbic acid during the ripening from a hard green to a hard ripe stage. Storing tomatoes in parchment wrappers did not affect the ascorbic acid content, and there were no losses when tomatoes were stored 240 hr. at room temperature.

During canning the loss of ascorbic acid was insignificant in the heating and pulping processes but considerable during concentration as is commonly practiced in the home canning of tomato juice. It is noted that in commercial canning homogenization is used in preference to concentration to prevent the separation of finely divided particles. Tomato juice stored in plain glass containers showed a small continuous loss of ascorbic acid when kept either in the light or dark. In amber glass containers the destruction was checked up to at least 80 days. In tin no losses occurred during a 30-day period. Commercial brands of tomato juice contained from 40 to 100 I. U. of ascorbic acid per ounce. Samples within a single brand varied from 28 to 85 units per ounce. Storage of opened tins of tomato juice at 21° C. was more destructive of ascorbic acid than storage at 5°, the average household refrigerator temperature. Under the latter conditions a 10- to 15-percent loss resulted after 20 hr. or more.

Vitamin C in Virginia apples, M. J. Satorius. (Va. Expt. Sta.). (*Va. Fruit, 27 (1939), No. 7, pp. 13, 14*).—Varieties of Virginia-grown apples as analyzed for 1 yr., both fresh and stored, ranked in decreasing vitamin C content in the order—Black Twig, Winter Banana, Ben Davis, Winesap, York Imperial, Northwestern Greening, Stayman Winesap, Red Rome, Arkansas Black, Rome Beauty, Virginia Beauty, Jonathan, Delicious, Senator Oliver, Grimes Golden, and Lowry. It is estimated that from 2 to 3 apples a day of the first-named variety would supply the vitamin C requirement for an adult man, whereas it would take from 6 to 8 apples of the varieties at the end of the list. Storage at 38° F. for 6 mo. resulted in an average decrease in vitamin C content of 45 percent. In general apple peel was from 4 to 5 times as rich in vitamin C as the flesh.

Subacute avitaminosis C [trans. title], G. Mouriquand, V. Edel, and M. Dauvergne (*Compt. Rend. Soc. Biol. [Paris], 130 (1939), No. 7, pp. 667-669*).—A stage in vitamin C deficiency midway between acute and chronic scurvy has been produced in guinea pigs by the administration of 0.25 mg. of ascorbic acid daily as a supplement to a scurvy-producing ration on which with 0.5 mg. of ascorbic acid scurvy of the chronic type is produced. In the subacute con-

dition the animal retains its appetite and continues to grow, although hemorrhagic symptoms of vitamin C deficiency appear about as early as in acute or chronic scurvy. If vitamin C treatment is given at about the thirty-fifth or fortieth day the symptoms do not yield as rapidly as in acute scurvy and may even progress to the death of the animal at about the fiftieth day. Examination of the blood at the fortieth day shows an anemia which is accentuated as the end approaches. X-ray examination reveals extensive decalcification of the epiphyses without the habitual periostosis of chronic scurvy. On autopsy the customary scorbutic lesions are found, with a pronounced deficiency of vitamin C in the adrenals. It is suggested that this type of scurvy resembles human scurvy more closely than either the chronic or acute scurvy of the guinea pig.

A low phosphorus diet and the response of rats to vitamin D_2, H. SCHNEIDER and H. STEENBOCK. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 128 (1939), No. 1, pp. 159–171, fig. 1*).—A synthetic low phosphorus vitamin D-free diet adequate in other nutritional requirements of the rat has been devised and used in place of the customary cereal rachitogenic diets for the study of rickets in rats. The diet consists of cerelose (glucose) 49 parts, egg white 18, cooked starch 20, a vitamin B concentrate vitab 4, phosphorus-free salts 4, and cottonseed oil 5 parts. Unsupplemented the diet contained 0.04 percent phosphorus and supplemented with 1.8 parts of $NaH_2PO_4.H_2O$ 0.41 percent of phosphorus, the same content as when supplemented with 4 percent of Wesson salts. The basal diet alone is designated as R–14, supplemented with the phosphate as NR–14, and supplemented with Wesson salts as WR–14.

The unsupplemented diet R–14 produced rickets in from 12 to 14 days, cessation of growth in from 4 to 5 weeks, and death with severe skeletal deformities in 6 weeks. When the diet was supplemented with vitamin D the healing of the metaphyses was identical with that observed when like amounts were fed in cereal diets, but growth was unsatisfactory or ceased entirely. Calcium and phosphorus balances and tissue analyses showed that vitamin D induced the utilization of phosphorus by the bones at the expense of depriving the soft tissues of their supply, thus inhibiting growth. When supplemented with sufficient phosphorus (diets NR–14 and WR–14) and vitamin D, the diets proved satisfactory for the nutrition of three successive generations.

Effect of amino acids on anemia caused by deaminized casein, R. E. GUERRANT and A. G. HOGAN. (Mo. Expt. Sta.). (*Jour. Biol. Chem., 128 (1939), No. 1, pp. 363–372, figs. 2*).—In further attempts to identify the agent which corrects the anemia caused by deaminized casein (E. S. R., 78, p. 280), hydrolyzed casein was fractionated and the soluble amino acids (which alone proved effective) were subjected to further fractionation with solid barium hydroxide and alcohol. This left the activity in the amino acids not precipitated as barium salts. Copper salt fractionation of these amino acids gave three fractions, the most active of which was the one insoluble in methyl alcohol but soluble in water. The amino acids separated from the copper salts were ineffective, as were also the essential amino acids not expected to be in the fraction. Various explanations for the negative results are suggested, with the statement that "since it now seems certain that this type of anemia can be prevented by certain of the amino acids, a solution of the immediate problem can be anticipated with some confidence."

Enlargement of the spleen of anemic rats similar to that reported by Hamre and Miller (E. S. R., 74, p. 286) is described.

TEXTILES AND CLOTHING

A study of certain factors related to consumers' choices in the purchase of "silk" street dresses and silk yard goods, E. L. Phelps, F. E. Petzel, A. S. Loring, and E. A. Nielson. (Minn. Expt. Sta.). (*Jour. Home Econ., 31 (1939), No. 6, pp. 393–398*).—Data collected in Minneapolis during the summer and fall of 1931 and winter of 1932 through personal interviews and observations of purchases are reported on the influence of various factors, including outside employment, age, and income, on consumer choices in silk street dresses and silk yard goods. In all 294 women were interviewed, only 68 of whom were employed outside the home. In addition 303 sales in the silk department of a large department store were observed.

Employment outside the home apparently had no influence on the average number of street dresses in active use or on the use of different kinds of silk fabrics. The women's wardrobes (street dresses) were composed chiefly of dresses thought to be of silk, over half of which were crepe, plain in color, and bought ready to wear. It is pointed out that the problems involved in purchasing street dresses and yard goods for dresses are important. Since ready-to-wear dresses of one type of fabric were the principal choice, "it is evident that reliable standards and dependable labeling are needed as guides to the quality of both workmanship and material."

Consumer demand in Missouri for selected articles of clothing, J. V. Coles (*Missouri Sta. Res. Bul. 300 (1939), pp. 58*).—This consumer preference study was limited to women's house dresses, afternoon dresses, slips, and hose. Information was secured by the questionnaire method from 1,917 women, the majority of whom were classed as small-town buyers, as they lived on farms and in villages or small towns. As some of the women filled out questionnaires for more than one commodity, 2,990 questionnaires were analyzed. For each commodity the information thus secured is presented under the headings—character of present purchases, demand for specific qualities, effect of income on practices and preferences, difficulties encountered in buying, and difficulties with wearing qualities. The types of store patronized by small-town and city buyers, price ranges of the commodities, and reasons for and against purchasing dresses and slips instead of making them in the home are included.

Among the difficulties most frequently mentioned were inability to secure correct sizes because the labeled sizes varied from actual sizes, difficulties in getting satisfactory leg lengths in hose, and difficulties in getting preshrunk and colorfast fabrics and pure-dye silks. Dissatisfaction was expressed with the construction of ready-made house and afternoon dresses and slips, particularly from the standpoint of finish and depth of seams. Inability to secure the desired articles because dealers did not carry them was naturally encountered more often by small-town than by city buyers.

Consumer demand in Missouri for selected articles of household textiles, J. V. Coles (*Missouri Sta. Res. Bul. 301 (1939), pp. 46*).—This study is similar in attack, sources of information, and analysis of data to the one noted above. The household textiles concerning which information was obtained by the questionnaire method from small-town (1,675 questionnaires) and city (1,073 questionnaires) buyers included blankets, window curtains (excluding draperies), towels, and sheets. The principal difficulties encountered in the purchase of sheets was the inability to get the size desired, particularly in length; of blankets difficulty in securing sizes and fibers desired and trouble with shrinkage and fading; of window curtains difficulty in securing really preshrunk and colorfast fabrics and lack of proper labeling on materials and difficulty

in getting desired sizes in ready-made curtains. Fewer difficulties were reported for towels, although there was some difficulty in getting the desired quality in ready-made towels. In this study also the inability to secure the articles desired because the dealers patronized do not carry them was a common complaint of the small-town buyers.

Résumé of an eight-year series of consumer studies on silk and rayon, P. B. MACK, F. G. WINNING, S. STARK, and E. R. GRAY. (Coop. Univ. Ill. et al.). (*Pa. State Col. Bul., 33 (1939), No. 42, pp. [2]+220, figs. 8*).—The results of a long-time investigation dealing with the extent and reliability of consumer information on silk and rayon fabrics and ready-made garments is presented in a series of separate reports as follows: Silk Dress Study I—Style, Workmanship, Size, and Fit of Garments in Relation to Price, by F. G. Winning and P. B. Mack (pp. 3–14); Silk Dress Study II—Characteristics of Fabrics and of Garments in Relation to Each Other and to Price, by P. B. Mack and F. G. Winning (pp. 15–35); Silk Dress Study III—Durability of Fabrics, by G. E. Cook and P. B. Mack (pp. 36–53); Testing Silk Fabrics for College Girls' Uniforms, by P. E. Keeney, G. P. Fulton, P. B. Mack, and S. Stark (pp. 54–61); A Study of Silk Underslips, by M. Laramy and P. B. Mack (pp. 62–64); Silk Yardage on the Market in 1934–1935, by M. D. Hale and P. B. Mack (pp. 65–70); What Consumers of Silk Want, by E. R. Gray and P. B. Mack (pp. 71–79); Why Silk Dresses Are Discarded, by M. D. Hale and P. B. Mack (pp. 80–85); Consumers' Judgment of Silk Fabrics, by G. E. Cook, M. Y. Moore, and P. B. Mack (pp. 86–94); A Study of Woven Rayon Fabrics on the Wholesale Market, by M. D. Hale, E. C. Hoffman, and P. B. Mack (pp. 95–108); A Study of Woven Rayon Fabrics on the Retail Market, by M. C. Green and P. B. Mack (pp. 109–138); Why Inexpensive Rayon Dresses Are Discarded, by M. E. Gregory and P. B. Mack (pp. 139–167); A Study of the Fastness of Dyes on Miscellaneous Dress Fabrics, by C. R. Phillips and P. B. Mack (pp. 168–213); and Trends in Consumer Information Concerning Silk and Rayon, by P. B. Mack (pp. 214–220).

HOME MANAGEMENT AND EQUIPMENT

Bibliography on consumer education, G. C. MANN (*New York and London: Harper & Bros., 1939, pp. IX+286*).—This annotated bibliography includes 1,981 titles of books, periodicals, etc., published up to November 15, 1938, grouped under the headings (1) consumer economics, including history and scope of the consumer movement, the place of the consumer in our economic system, family budgets and standards of living, standards, labels, and consumer protection, prices, advertising and other methods of stimulating buying, cooperatives, Government and the consumer, and money and credit; (2) information on purchasing grouped under different commodities; (3) teaching consumer education, including textbooks, teaching aids, curricula, and projects; (4) references, including bibliographies, magazines, and publications; and (5) general, including commercial publications. Author and subject indexes and lists of publishers, periodicals, and commercial concerns are included in appendixes.

Important consumer problems of the rural family of the South (*Assoc. South. Agr. Workers Proc., 40 (1939), pp. 126–129*).—Abstracts are given of contributions to this panel discussion: Finance and Credit, by D. Dickins (Miss. Expt. Sta.); Clothing, by M. A. Grimes (Tex. Sta.); Education, by E. E. Proctor; and Household Equipment Needs in Farm Homes of the South, by M. A. Mason.

[Meeting farm family expenses], D. DICKINS (*Miss. Farm Res. [Mississippi Sta.], 2 (1939), No. 7, pp. 1, 8*).—In this comparison of the incomes and expendi-

tures of 23 Mississippi farm families who lived within their current income during 1938–39 with those of 23 comparable families whose expenses exceeded their income during the same period, the most important difference between the two groups was in the value of the food produced for home consumption, averaging $308 and only $215, respectively. This, together with the fact that the latter group spent only $5 a year more than the former on purchased foods, shows that insufficient production of food on the farm was not made up by cash purchases and explains in part the greater sickness during the report year of the low-producing group. It is thought that an abundance of home-produced food is about the only guarantee the typical farm family of Mississippi has of getting a good diet and in turn better health.

Greater cash income for rural girls a community problem, D. DICKINS (*Miss. Farm Res.* [*Mississippi Sta.*], *2* (*1939*), *No. 3, p. 4*).—Attention is called to the very limited gainful employment for out-of-school girls and young women on the farms in the State, with data in illustration from a random sample of white women in two of the poorer agricultural counties. A few suggestions are given for possible remunerative work, and community responsibility for initiative in the development of opportunities is urged in order that this group may have the experience of handling money of their own making.

Wood finishes, B. M. KUSCHKE ([*Rhode Island Sta.*] *Misc. Pub. 3* (*1939*), *pp. 7, figs. 2*).—Certain facts concerning types of floor finishes and methods of applying them, acquired in the course of an extensive investigation still in progress, are presented for the guidance of homemakers in the choice, application, and care of finishes. Special emphasis is given to penetrating seal finishes and water emulsion waxes, and simple tests for quality in the latter are described. The use of color in floor finishes, the preparation of surfaces to be painted, paint cleaning with a dilute glue solution, and treatment of concrete floors to prevent the tracking of grit are among the topics discussed.

Study of the kinds and maintenances of floor finishes best suited for household use (*Rhode Island Sta. Rpt.* [*1938*], *pp. 50, 51*).—Progress is noted on a comparison of different finishes for soft pine flooring.

MISCELLANEOUS

Forty-ninth Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut, for the year ending June 30, 1937, W. L. SLATE ET AL. ([*Connecticut*] *Storrs Sta. Rpt. 1937, pp.* [*471*], *pls. 28, figs. 58*).—This includes reprints of Bulletins 221–229, all of which have been previously noted.

[Reports of progress, Indiana Station experiment fields and farms], A. T. WIANCKO ET AL. (*Indiana Sta. Circs. 242* (*1939*), *pp. 20, fig. 1; 243, pp. 8; 244, pp. 8; 245, pp. 4; 246, pp. 4; 247, pp. 7; 248, pp. 8*).—These circulars report data noted elsewhere in this issue for the following: Nos. 242, Soils and Crops Experiment Farm, 1915–38; 243, Bedford Experiment Field (Moses Fell Annex), 1916–38; 244, Jennings County Experiment Field, 1921–38; 245, Herbert Davis Forestry Farm Soils and Crops Experiments, 1923–38; 246, Huntington Experiment Field, 1919–38; 247, Sand Experiment Field, 1924–38; and 248, Pinney-Purdue Experiment Fields, 1920–38.

Forty-ninth Annual Report [of New Mexico Station, 1938], F. GARCIA (*New Mexico Sta. Rpt. 1938, pp.* [*1*]+*88, figs. 17*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-first Annual Report [of Rhode Island Station, 1938], B. E. GILBERT (*Rhode Island Sta. Rpt.* [*1938*], *pp.* [*2*]+*64*+[*1*], *fig. 1*).—The experimental

work not previously referred to is for the most part noted elsewhere in this issue. Temperature and precipitation records are also summarized.

Farm Research, [July 1, 1939] (*Farm Res.* [*New York State Sta.*], *5* (*1939*), *No. 3, pp. 12, figs. 12*).—In addition to several articles noted elsewhere in this issue and brief notes, this number includes State Jersey Cattle Club Field Day and Sale a Success, by A. C. Dahlberg (p. 7); Mexican Bean Beetle Here To Stay, by H. C. Huckett (p. 8); and The Use of the Financial Stimulus in High Grade Milk Production, by R. S. Breed (p. 10).

Bimonthly Bulletin, [July 1939] (*North Dakota Sta. Bimo. Bul., 1* (*1939*), *No. 6, pp. 27, figs. 3*).—In addition to articles noted elsewhere in this issue and brief abstracts of current contributions to agricultural science, this number contains Wheat Crop Improvement and Wheat Quality, by R. H. Harris (pp. 4–6); The Bluegrasses of North Dakota, by O. A. Stevens (pp. 6, 7); and Official Tractor Tests, by H. F. McColly (pp. 8, 9).

NOTES

Arkansas University and Station.—Dr. John C. Futrall, associated with the institution since 1894 and president since 1914, was killed in an automobile accident September 12 at the age of 66 years. A native of Tennessee, President Futrall was granted the B. A. and M. A. degrees from the University of Virginia, took additional graduate work at the University of Chicago, Johns Hopkins University, and the Universities of Bonn and Halle, and received honorary LL. D. degrees from Tulane University and the University of New Mexico. He was president of the National Association of State Universities in 1925–26 and the Association of Land-Grant Colleges and Universities in 1932–33.

The resignations are noted of J. G. McNeely, instructor in rural economics and sociology, R. M. Theis, instructor in agricultural chemistry, and R. S. Woodward, technical assistant in the Fruit and Truck Substation. Hosea Fincher has been appointed manager of the university creamery, vice W. P. Cotton resigned.

California University and Station.—At the recent celebration of the fiftieth anniversary of the founding of the University of Sofiya, the degree of doctor of agriculture was awarded Dean and Director C. B. Hutchison in recognition of assistance given the university from 1924 to 1927 as a member of the European Mission of the International Education Board of the Rockefeller Foundation.

Charles F. Shaw, professor of soil technology since 1913, died September 12, aged 58 years. A native of New York and a graduate of Cornell University in 1906, he was associated with soils work there from 1905 to 1906, with the U. S. D. A. Bureau of Soils from 1906 to 1907, and the Pennsylvania College and Station from 1907 to 1913. He had also served as a visiting professor at the University of Nanking in 1930 and in an advisory capacity with the Bureau of Soils from 1909 to 1913 and the Mexican Irrigation Commission from 1926 to 1928. He was widely recognized as an authority in soil morphology and taxonomy, serving as president of the Soil Science Society in 1927 and since 1936 as president of the North American subcommittee of the International Society of Soil Science.

Arthur H. Folger, superintendent of official testing in the department of animal husbandry at Davis, has resigned to become a regional director in the U. S. D. A. Farm Security Administration.

Connecticut University and Storrs Station.—The university has accepted from the Eastern States Farmers' Exchange a grant of $1,800 per year for research in nutritional diseases under the direction of the station. A similar grant from the New England Epidemic Tremor Research Association, Inc., of at least $2,500 will also be under the direction of the station animal diseases department for a study of avian encephalomyelitis, commonly known as epidemic tremor.

The university department of economics has been reorganized by division into departments of economics and agricultural economics, headed, respectively, by Albert E. Waugh and Donald O. Hammerberg.

Dr. Dorothea Rudnick, research assistant in genetics, has resigned to accept a position in Wellesley College and has been succeeded by Elizabeth Baumann. Carl F. Clancy, research assistant in animal diseases, has resigned to continue graduate work in Yale University and has been succeeded by Jacob Levine.

Florida University and Station.—*Science* notes that the U. S. Sugar Corporation of Clewiston, Fla., has made a gift of $1,000 to establish the Napoleon B. Bernard fellowship for graduate work on the soil, climate, and agriculture of the Everglades.

Iowa College and Station.—Lee W. Forman, superintendent of experiments and research assistant professor, died September 9, aged 58 years. A native of Iowa, he received the B. S. degree there in 1909 and the M. S. A. degree in 1913. He had been connected continuously since 1909 with the soils work of the institution, giving special attention to soil fertility and in recent years to pasture improvement.

Kansas College and Station.—Dr. D. B. Creager has resigned as assistant professor of botany and plant pathology. Dr. C. C. Morrill, associate professor of pathology in the division of veterinary medicine, resigned August 31, and was succeeded by Dr. R. P. Wagers. Merton L. Otto has been appointed instructor in agricultural economics.

Louisiana University.—Lawrence V. George has been appointed station editor, effective September 1.

Maine Station.—Donald H. Perrin has been appointed field assistant in entomology to have charge of the winter testing in Florida of Maine-grown seed stocks of potatoes and of the new Foundation potato seed-stock program, which is handled in Maine during the summer. Joan H. Stacy has been appointed assistant in biology vice Carol H. Griffin, resigned.

Massachusetts Station.—Oreana A. Merriam, research assistant in home economics nutrition, resigned September 1 to accept a teaching position in the Plattsburg, N. Y., Teachers College and has been succeeded by Anne W. Wertz.

Mississippi College and Station.—William R. Perkins, vice director emeritus since 1937, died August 21 at the age of 72 years. Graduating from the college in 1891, he remained there as assistant chemist for 2 years and as professor of agronomy and agronomist for 17 years. From 1910 to 1912 he was associated with the agronomic work of Clemson College and from 1915 to 1928 with that in Louisiana. Returning to Mississippi as assistant director of the South Mississippi Substation, he became director of the station in 1930 and in 1932 assistant director. At the time of his death he was engaged in a compilation of a history of the station. In the words of a recent tribute in *Science*, "he was widely known in the Southern States for his work as an agricultural chemist, agronomist, and administrator in extension and experiment stations. He early recognized the economic futility of a one-crop system, cotton, and the distress to which it would finally lead southern agriculture. He saw the boundless possibilities in the growing of forage crops and the production of livestock under the most favorable climatic conditions in this country. In and out of season, he counseled conservation of the soil and diversification of agriculture. . . . Southern agriculture has lost a zealous advocate, an able administrator, a careful student, and a just man."

Missouri University and Station.—By special provision of the legislature, instruction and investigation work in floriculture has been established. James E. Smith, Jr., has been appointed in charge of this project.

Montana College and Station.—Dr. P. L. Slagsvold has resigned as professor of agricultural economics and agricultural economist effective Septem-

ber 1 to accept a position as Chief of the Planning Section, U. S. D. A. Farm Security Administration, with headquarters at Denver, Colo. M. A. Bell, superintendent of the Northern Montana Substation, has resigned to become superintendent of the Woodward, Okla., Field Station and supervisor of experiment stations operated by the Division of Dry Land Agriculture of the U. S. D. A. Bureau of Plant Industry for the southern Great Plains.

Dr. A. R. Patton, research assistant in poultry husbandry in the Colorado Station, has been appointed head of the department of chemistry and meteorology in the station vice Edmund Burke, who became consulting chemist September 1. Other appointments effective September 1 included Samuel C. Litzenberger as instructor and assistant in agronomy and John N. Cummings as assistant in animal husbandry. On October 1 Dr. Waldo E. Carlson succeeded Dr. Frank T. Donaldson, resigned, as assistant professor of chemistry and meteorology.

New Mexico College and Station.—G. R. Hamiel, formerly associate professor of chemistry and associate chemist, is devoting full time to teaching chemistry. The following appointments have been made as instructors and assistants in the station: J. L. Flowers, agronomy; Dr. T. D. Bell, animal husbandry; Dr. E. C. Smith, chemistry; and G. W. Schneider, horticulture.

Cornell University.—The first wing of a $300,000 laboratory building for nutrition research is under construction.

North Dakota College and Station.—Effective July 1, the institutions of higher learning, the station, the extension service, and the State system of vocational education were placed under the control of a State Board of Higher Education. This board was created by an initiated constitutional amendment which removed the control of the foregoing institutions from the State Board of Administration. The new board consists of seven appointees by the Governor with the approval of the State senate, selections being made from a list of three nominees for each vacancy submitted by the unanimous choice of a nominating committee consisting of the then sitting chief justice of the supreme court, the State superintendent of public instruction, and the president of the North Dakota Educational Association. The original members of the board are appointed for terms ranging from 1 to 7 years and thereafter for 7 years, and removal is possible only by impeachment by the house of representatives followed by conviction by the State senate.

Ohio Station.—Dr. Charles F. Rogers, instructor and assistant in agricultural biochemistry in the Minnesota University and Station, has been appointed associate in biochemistry.

Rhode Island College and Station.—President R. G. Bressler has been appointed acting director of the station and extension service.

Clemson College.—President E. W. Sikes has tendered his resignation, with a view to retirement, but has consented to remain in office until his successor has been selected.

South Dakota College and Station.—Joseph G. Hutton, professor of soils and associate agronomist, died September 22 at the age of 65 years. A native of Indiana, he completed his undergraduate work at the University of Chicago in 1906 and received his M. S. degree from the University of Illinois in 1910. He had been associated with the department of agronomy since 1911, being virtually a pioneer in the field of fertility and conservation of South Dakota soils. He was also recognized as a poet, philosopher, and scholar, contributing to various anthologies of verse and conducting a program which he called Farm Rhymes over the college radio station.

Recent additions to the station include Lida M. Burrill as research assistant in home economics and John A. Rohlf as assistant editor.

Virginia Station.—A. B. Stephenson has been appointed assistant poultry husbandman.

Washington Station.—F. B. Wolberg has been appointed dairy husbandman at the Western Washington Substation.

Wisconsin University and Station.—Frederick L. Musbach, professor of soils and since 1912 in charge of Marshfield Substation, died on September 14 following an automobile accident. Born in Wisconsin in 1877 and graduating from the university in 1909, his early work was on the Soil Survey of northern Wisconsin. He did much to develop experimental work on soil management both at Marshfield and through the Spooner and Ashland Substations, and had large influence on the improvement of farm practice in central and northern Wisconsin.

Frances L. Zuill, director of home economics at the University of Iowa, has succeeded Abby L. Marlatt, retired, as director of home economics.

Necrology.—Hon. Fred S. Purnell, a Member of Congress from Indiana from 1917 to 1933 and sponsor in the House of Representatives of the legislation culminating in the Purnell Act of 1925 for the increased support of the State agricultural experiment stations, died in Washington, D. C., on October 21 at the age of 57 years. Since 1938 he had been associated with the legal staff of the General Accounting Office.

Thomas D. Rice, a senior soil scientist in the U. S. Department of Agriculture, died August 23 at the age of 61 years. A native of Florida and a graduate of the University of North Carolina in 1900, he became associated with the Bureau of Soils in 1901 and had become closely identified with the Soil Survey, especially in its examination of prairie soils.

New Journals and Changes.—*Ceres* is a bimonthly published by the Ceres Club of the College of Agriculture and Veterinary Science at Viçosa, Minas Geraes, Brazil. It is intended to include both original articles and practical information pertaining to agriculture, veterinary medicine, and rural industries. The initial number contains among others Progress in Cotton Improvement at the College, by J. B. Griffing; Some Factors Which Influence the Milk Production of Mixed Simmental Cows Under a System of "Returns" (Breeding Back to Native Stock), by G. G. Carneiro; Green Manure, by A. Dorofeeff; Biological Control of Insects, by R. W. E. Tucker; Manufacture of Wine From Oranges, by M. Pavageau; Some Amaryllis of the Region as Material of Great Value for the Study of Cytology, by E. Alencar; The Planting of Citrus Orchards, by G. Corrêa; Folding of the Leaves of Sugarcane, by O. A. Drummond; and The Value of an Adherent Gas in Combating Leaf-Eating Ants and Termites, by B. T. Snipes. News notes, abstracts (mainly credited to *Experiment Station Record*), and other material are appended.

Agronomia Lusitana is being published as a quarterly under the auspices of the National Agricultural Station of Portugal. It is intended essentially as the organ for publication of the studies carried on at the station, but foreign contributions are welcomed. The initial number contains the following articles: Bud Mutations in Portuguese Pear and Apple Varieties, by J. Vieira Natividade; On Ecdysis in the African Migratory Locust, by A. J. Duarte; Some Portuguese Mycetes, by Emmanuele de Sousa da Camara and Carlos Gomes da Luz; Studies on *Puccinia anomala* Rost, by Branquinho D'Oliveira; and Inoculation Experiments with *Bacterium savastanoi* E. F. Smith, and *Bacterium savastanoi* var. *fraxini* N. A. Brown, by Maria de Lourdes D'Oliveira.

Science Progress, now in its thirty-fourth volume, has suspended publication because of the war conditions.

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